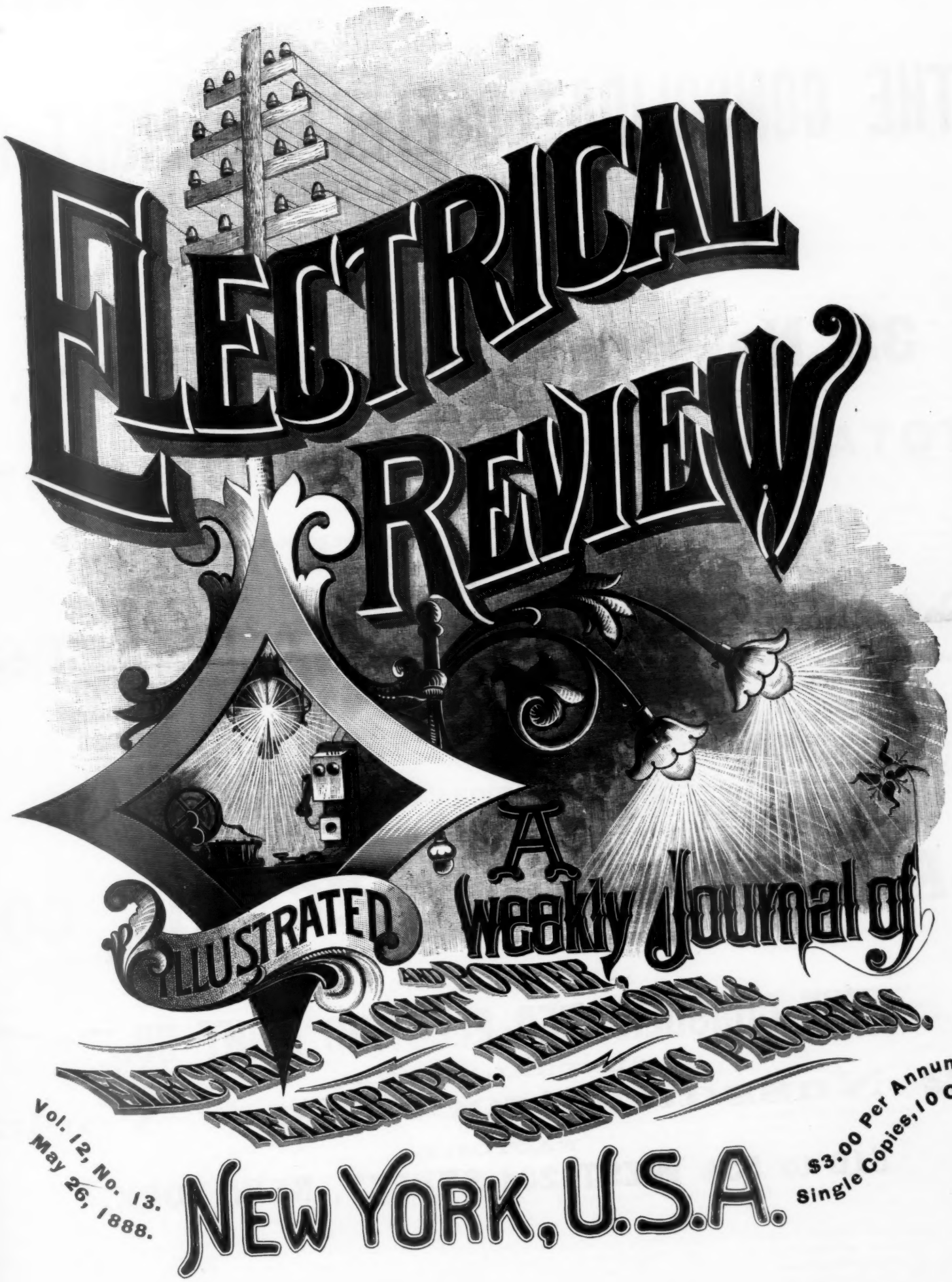
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THE CONSOLIDATED ELECTRIC LIGHT CO.

GEORGE WESTINGHOUSE, Jr., President,

OWNERS OF THE

SAWYER-MAN PATENTS,

GENERAL OFFICE:

32 Nassau Street, New York.

TOTAL NUMBER OF INCANDESCENTS

IN USE

UNDER THE PROTECTION

OF THE

SAWYER-MAN PATENTS,

December 15, 1887,	308,302
April 15, 1888,	460,063
Increase for the Last Four Months,	151,761

DETAILED LIST OF PLANTS AND STATIONS WILL BE MAILED ON APPLICATION.

SAWYER-MAN ELECTRIC CO.

HENRY C. DAVIS, President,

COMMERCIAL AGENTS OF

THE CONSOLIDATED ELECTRIC LIGHT CO.,

GENERAL OFFICE:

32 Nassau Street, New York.

FACTORY:

510 to 534 WEST 23d STREET, NEW YORK.

ELECTRICAL REVIEW

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A WEEKLY JOURNAL OF

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Electric Temperature Regulator.

The Tucker Electrical Company, of New York, manufacture the automatic temperature regulator, illustrated in this issue. The application shown is in connection with a drawing room car or sleeping car. This electric apparatus we described in the REVIEW, March 17th. In the application now shown, two of the movements are placed at the end of each car, one on each side, and connected with the ventilators. The apparatus is connected with thermostats located at any desired points in the car, and by this means the temperature in the car is automatically regulated.

This is a convenient and useful application of electricity, and will save much labor on the part of trainmen, as well as keep comfortable the passengers. The annoyance of alternately hot and cold cars has been experienced by every traveller. With the device of the Tucker Company, the temperature is automatically regulated, and every traveller made happy.

She Mistook the Shadow for the Shore

A remarkable instance of optical illusion occasioned by the brilliancy of electric lights, occurred in Albany one evening, which caused a young lady to take a chilly bath in the beautiful Williamette.

As a young law student, accompanied by a lady friend, was stepping out of a skiff on to the landing at Monteith's mill, the lady, mistaking the brilliantly reflected shadow of the landing for the actual one, stepped out of the boat, and at once went out of sight in a considerable depth of water.

The young man, possessing all the presence of mind characteristic of the legal fraternity, immediately dived after her, and after considerable difficulty rescued her.

An Electric Light in Every Cell.

The buildings of the new Middle State Industrial Reformatory, at Huntingdon, Pa., are so far completed that the commissioners have determined to turn them over to the Governor. The 500 cells now ready contain an incandescent burner and steam heat apparatus. The reformatory has been nine years in building, and is a complete edifice with all the modern improvements.

Mica as a Dielectric.

The following are the chief results of the experiments. The specific inductive capacity of mica plates obtained from Rafael, of Breslau, is 6.64. The capacity of a condenser formed of such plates is independent of the value of the potential used for charging the condenser. On altering the duration of the charge from 0.002 to 1.200 seconds, the discharge always being made after 0.007 second, the capacity altered by 1.8 per cent. Mica condensors have an exceptional insulation and specific resistance, which is apparently more than 6×10^{21} times greater than that of mercury. This is, however, only true so long as the mica is thoroughly dry; and it is possible that the discordant results obtained by various observers may be due to insufficient care in working with perfectly dry plates.

Effect of Temperature on the Magnetization of Iron.

The fact that an iron bar heated to redness loses its magnetism has been long known. Rowland, in 1873, working up to a temperature of 230°, found no change; Poloni, in 1882, and MacRae, in 1885, arrived at the same negative result for temperatures up to 300°; Berson, in 1886, found that nickel loses its magnetic properties at 300°, but iron shows no change up to 340°. In all these cases the temperatures were too low.

The method adopted by the author was to measure the magnetic permeability of an iron bar, by determining the coefficient of self-induction of a solenoid surrounding it. In order to eliminate the effect due to the solenoid itself, an exactly similar solenoid was placed in the opposite branch of the Wheatstone bridge. The absolute value of the magnetic permeability could not be determined on account of the effect of the ends of the bar; for the same reason the remanent magnetism was not determined.

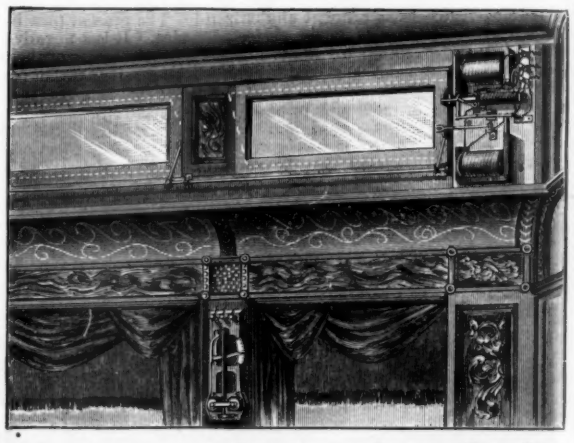
The bar was heated by means of a doubly-wound spiral of platinum wire surrounding it, through which a current of about 15 to 18 amperes could be sent. The solenoid was protected from the heated platinum spiral by means of a water jacket. A thermo electric couple, consisting of a pure platinum wire, and one of platinum alloyed with 10 per cent. of rhodium, was placed next the iron bar, but separated from it by a sheet of mica, and served to measure the temperature approximately within about 10°. The thermo-electric couple was calibrated previously by means of observations on the boiling point of ammonium chloride (340°), the boiling point of selenium (665°), and the point of fusion of potassium sulphate (1015°).

The experiments were made on a bar of soft iron, with fields of the intensity of 35, 100, and 200 C. G. S. units. From the plotted results it is apparent that iron preserves its magnetic properties for all temperatures below 680°, but that after this point the loss is very rapid. At about 750° there is scarcely any trace left, and at 770° the magnetism has entirely disappeared. This rapid change, therefore, occurs through a range of temperature of from 80° to 100°. On cooling, the magnetic properties reappear.

—— One John McCabe and a couple of companions went to work in a cool, systematic and thoroughly scientific manner, while the bright sun was shining its brightest, and removed two miles of wire from the poles of the Allegheny County Electric Light Company, Pittsburgh. Recently, they removed a set of wires running up the Penn Incline, and on Monday, Tuesday and Wednesday of this week they removed wire on Penn avenue from Thirtieth to Fortieth street. They posed as repairmen removing abandoned wire and did their work systematically and well. McCabe has been arrested, after he had sold the wire to a junk dealer.

The Electric Wires and the Subways.

Corporation Counsel Beekman has received a letter from Mayor Hewitt, of New York, suggesting that suit be brought to compel the electric companies to put their wires under ground in the subways prepared for them, and remove the poles and wires from the streets. Mr. Beekman said in an interview: "As soon as I received the Mayor's letter, I directed one of my assistants to ascertain what sections of the subway are ready for use, and when they were in readiness for the reception of electric wires. As soon as I get this information, I shall ask the officers of electric companies having wires stretched on poles along the streets, when the subways are ready, why they have not put their wires under ground. The answer they will probably make is that the subway as constructed is not suitable for their use. Then I shall consult with them to find out whether or not they will oppose the bringing of a suit on the part of the city, for the issuing of a mandamus to compel them to place their wires under ground where the subways are ready for use, and thus the question whether or not the city has the power to compel the removal of poles and overhead wires will be tested."



ELECTRIC TEMPERATURE REGULATOR ON DRAWING ROOM CARS.

Cost in 1844.

Grove, lecturing at the Royal Institute in 1844, stated the cost of one horse-power for twenty-four hours, produced by the electro-magnetic engines then known, to be £1 16s. 10½d.; that is, nearly 1s. 6½d. per hour. Now Davey-Paxman will give us a steam engine, burning a couple of pounds of coal per one horse-power per hour, and Crompton, Brush, or other makers will give us dynamos of from eighty-five to ninety per cent. efficiency, a state of affairs that, by comparison, cannot but be regarded as unsatisfactory.—*London Electrical Engineer.*

—— A painter at work on the city hall, Pittsburgh, fell from the scaffold where he was working, and in falling caught hold of a live alternating current wire, No. 1 Simplex insulation, and held on without receiving any injury or shock until taken down by a ladder. This speaks well for the Simplex insulation, and is an instance where aerial wires saved a man's life.

A New Electric Submarine Torpedo Boat.

Mr. J. F. Waddington's submarine torpedo boat has the spindle shape that necessarily characterizes such vessels. It is a boat of small dimensions, capable of carrying one or two persons, and is 36 feet in length and 6 in width. It is divided into three compartments by two bulkheads. The end chambers are filled with compressed air, which may be used as needed for respiration or for furnishing motive power.

The central chamber, which the officer occupies, contains enough air to allow two persons to remain in it for six consecutive hours. The foul air is expelled through special valves, that open automatically as soon as the internal pressure becomes greater than the external. It might be possible, however, to absorb the disengaged carbonic acid by means of chemical re-agents, in order to keep the air from getting foul. The central chamber is provided above with a small lookout, containing large light ports, and which can be closed hermetically by a hatch that, at the same time, gives access to the interior. Movable hand-rails can be put in place around the lookout when the boat is not submerged.

The electricity that furnishes the motive power is derived from accumulators of 600 amperes-hour each, the boxes of which, 45 in number, are arranged at the bottom of the central chamber. These accumulators are assembled in series and attached to the electric machine that directly actuates the propeller. The latter makes 750 revolutions per minute.

According to data published in the *Yacht* and *Industries*, a power of 7.96 electric horses, corresponding to a current of 66 amperes and 90 volts, permits of a trip of 80 miles being made at full speed, say for 10 hours at the rate of 8 miles per hour, without any necessity of recharging the accumulators. On diminishing the speed, 110 or even 115 miles might be attained. It is interesting to compare these figures with the results obtained by Capt. Krebs.

The boat is likewise provided with a well arranged system of connecting devices, submersion screws, counterpoises for ballast, etc.

Submersion is effected and regulated by means of two vertical helices contained in tubes resting against the bulkheads of the air chambers. Each of these is actuated by a special motor, and can thus be driven separately. The boat is provided, too, with two plates with counterpoises movable around a horizontal axis. These are situated on the outside, and can be manœuvered from within in order to effect a submersion while running. The boat has, in addition, four submersion rudders, two of them horizontal and two vertical, designed to assure a horizontal position. These rudders act automatically under the impulsion of a special electro-motor, controlled by a sort of pendulum, and which enters into play as soon as the boat inclines the least bit. Finally, care has been taken to see that the boat can be at once brought to the surface in case of pressing danger, and, to this effect, it is provided beneath with a heavy weight that can be immediately detached. Two large boxes at the sides of the central chamber can be filled with water when the boat is on the surface

and it is desired to prepare for submersion. By reason of its special destination the boat carries three torpedoes attached externally, but held merely by hooks that can be manœuvered from the interior. Two of them are self-moving torpedoes, whose propeller begins to run automatically when they are detached from the boat. The third is a mine torpedo, fixed on the deck back of the lookout, and serves for attacking ships at anchor provided with their protecting nets. This the boat sets free under the enemy's ship, and then moves away, but remains in communication with the torpedo through electric wires that permit it to explode the latter at the proper moment.

As shown in Fig. 1, all the manœuvering levers are grouped in the central chamber within reach of the officer, who can, without exertion, effect all the necessary movements. Upon filling the side reservoirs with water at the surface, the buoyancy is diminished. The submersion of the boat while running is assured by acting, preferably, upon the lateral plates, so as to incline them. The speed then reaches five knots per hour. Recourse may be had also to the vertical screws, that serve to regulate the depth of submersion by their velocity; but they are especially employed to effect a submersion *in situ*.

From this description, it will be seen that all the details of this boat have been carefully elaborated, and there is reason to think that, without being yet definitive, this new type is destined to give important results in practice. The English journals, moreover, inform us that very encouraging trials of it have been made at Liverpool in the presence of delegates from various naval powers.—*La Nature.*

Annual Meeting.

The annual meeting of the American Institute of Electrical Engineers was held at the Civil Engineers' Home on 23d street last week, and the papers announced in our last issue were read and discussed. Some of them appear in this issue.

The paper of Nikola Tesla described his new alternating current motor, which was illustrated in the REVIEW May 12, and this attracted much attention and discussion.

Besides the officers holding over, the gentlemen named below were elected: President, Edward Weston; vice-presidents, Elihu Thomson, Francis R. Upton, T. C. Martin; secretary, Ralph W. Pope; treasurer, Geo. M. Phelps, Jr.; managers, Charles Cuttriss, Geo. B. Prescott, Jr., Wm. Mever, Jr., T. D. Lockwood.

After the adjournment of the meeting Wednesday afternoon, the attendants visited the Electric Club, and enjoyed a pleasant hour listening to the phonograph.

—— The electric lights on the bridge are so bright that pilots complain of them, and shades and reflectors will probably be put on to diffuse the light more.

—— The plant of the Southwestern Electric Light and Power Company, New Orleans, has been purchased by the Westinghouse Electric Light Company, of Pittsburgh, Pa.

—— The City of Mexico will soon be one of the best lighted cities on the continent. New poles for electric lights are being erected daily in the city. The Brush electric light station is being largely increased.

—— The Waterhouse system seems to be successful, and we instance the plant at Newark, N. J. They started in against formidable competition, and held their own, tripling the 100 light plant first installed.

—— An electric light plant, comprising dynamo and detail machinery for central station of 600 incandescent light capacity, with 300 incandescent lamps, 10,000 feet of main wire, engine and boiler, is to be erected in Beaumont, Tex. Messrs. Thomas & Gorman, Beaumont, Tex., have it in charge.

—— The Dunkirk (N. Y.) common council has passed resolutions to put in the electric light and to issue bonds for the same; also authorizing the mayor and the city clerk to sign a contract with the Western Electric Company of Chicago. The contract has been signed, and the company is to have the plant completed in sixty days, and to run it for thirty days before the city is required to accept it.

The Decision of Judge Wallace in the Electric Light Suit.

UNITED STATES CIRCUIT COURT,
SOUTHERN DISTRICT OF NEW YORK.

THE EDISON ELECTRIC LIGHT COMPANY
vs.
UNITED STATES ELECTRIC LIGHTING COMPANY.

WALLACE, *J.*: The plea to the bill of complaint, which has been set down for argument, alleges in substance that the defendant should not be compelled to answer, because by reason of the facts averred in the plea the remedy of the complainant is plain, adequate and complete at law, and this court should not take cognizance in equity of the suit.

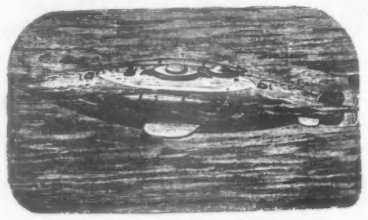
The bill alleges the infringement by the defendant of letters patent of the United States, No. 263,140 dated August 22, 1882, granted to the complainant upon the application of Edison for an improvement in dynamo electric machines, the invention of Edison. The bill shows that Edison made his application for a patent August 9, 1880, and assigned his title to the complainant June, 1881. Besides the averments usually contained in bills to restrain infringment of patents, allegations are introduced by way of anticipation of the supposed defense to the bill in order to meet any issue tendered by the defendant. These averments are, in substance, that the defendant may wrongfully pretend, as an excuse for its wrongful acts in the premises, that the complainant's letters patent are no longer in force or operative, because at the time they were granted the invention described therein had been first patented in the Austro-Hungarian Empire for the term of one year, and that such foreign patent has expired, and consequently the term of complainant's patent has expired; but that the facts are, that Edison at the time of making the invention was, and always since has been, a resident and citizen of the United States, and made, perfected, and reduced the invention to practice in the United States, and made and filed his application for a patent in the United States Patent Office, August 9, 1880, and prior to any application made by him abroad, and that in order to protect his invention in foreign countries it was necessary that he should promptly apply for letters patent abroad, and the issue of the foreign patent preceded the United States patent solely because of the greater diligence and more prompt procedure of the foreign administration. The bill further avers that the letters patent of the Austro-Hungarian Empire were granted for the term of fifteen years from their date, and are in full force and effect.

The plea alleges that prior to the granting of the complainant's letters patent the invention or discovery, described and claimed therein, had been patented by Edison, or with his knowledge, consent and procurement, by a public patent of the Austro-Hungarian Empire granted to Edison July 21, 1881; that the term for which the foreign patent was granted was one year from its date, and expired on the 21st day of July, 1882; that subsequently, by grant made on the 19th day of July, 1882, the foreign patent was extended for a new term of one year, and the extended term expired on the 21st day of July, 1883; and that the extended Austro-Hungarian patent was existing and unexpired when the complainant's letters patent were granted, but the term thereof expired July 21, 1883, and before the commencement of this suit. The plea denies the averments of the bill that the Austro-Hungarian patent was granted for the term of fifteen years and was in full force and effect when this suit was brought.

If the complainant's patent had expired before the bringing of this suit, it is plain that a court of equity has no jurisdiction of the cause of action for infringement, and the complainant can only proceed by a suit at law for the recovery of damages. Root *vs.* Railway Co., 105 U. S., 189.

It is contended for the complainant that such a defense cannot be raised by a plea, and if it could that the present plea is insufficient both in matters of form and substance to present such a plea.

One of the uses of a plea in suits at law or in chancery is to object to the jurisdiction of the court. Livingston *vs.* Story, 11 Pet., 351; Wickliffe *vs.* Owing, 17 How., 47, 51. In a case where it was urged that the sum involved was not of sufficient amount to authorize a court of chancery to take cognizance of the cause, Chancellor Walworth



T T.—Lateral Torpedos.

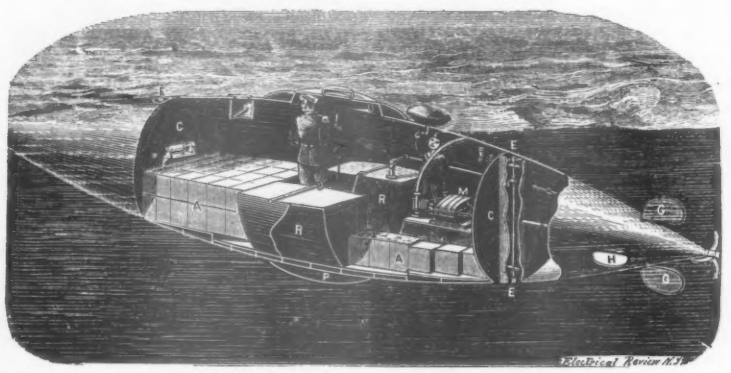
FIG. 2.—EXTERNAL VIEW OF THE BOAT.

said: "If that fact did not appear upon the face of the bill, it might undoubtedly have been pleaded in bar of relief." Smets *vs.* William, 4 Paige, 364. In Beames on Pleas, 55, it is stated: "Those pleas which are commonly called pleas to jurisdiction, do not proceed the length of disputing the right of a plaintiff in the subject of the suit, or allege any disability on the part of the plaintiff to prosecute the suit, but simply assert that a Court of Chancery is not the proper court to take cognizance of those rights." The present plea falls within this definition.

There is no force in the objection that the plea is a negative plea. Such pleas are sanctioned, and are now frequently resorted to. A familiar instance is a plea denying partnership where the bill prays on account of partnership transactions.

The present plea is not strictly a negative plea. It is a negative plea so far as it denies the averments of the bill that the term of the Austro-Hungarian patent is for fifteen years, and that the patent was in full force when the suit was brought. It is an affirmative plea as to all the other facts which it sets forth. The effect of the plea is to admit all the facts alleged in the bill except those specifically denied, and to meet the case made by the bill by alleging the new facts intended to show that the complainant's patent had expired at the time of the commencement of the suit. If the bill did not contain the anticipatory averments which have been inserted in it, the denial in the plea would have been unnecessary. With this denial in the plea, it is only necessary to inquire whether the facts set up affirmatively are a defense to to the suit, admitting that everything in the bill not denied is true.

A pleading is sufficient which sets forth documents according to their tenor or legal effect, and avers the substantive facts relied on as a cause of action or defense. Tested by this rule, the plea is sufficient in form without making a profert of the Austro-Hungarian patent, or setting out in detail any of the evidential facts to show that it was a valid grant of letters patent for the invention, for the term of one year. If issue were taken on the plea, it would only be necessary for the defendant to produce a properly authenticated copy of the foreign patent and show the seal or signature affixed to it to be the act of an officer duly authorized to issue patents. The effect and operation of the patent is to be determined as a question of law by the terms of the document, unless evidence of the foreign law is introduced to qualify or controvert the construction which would otherwise be placed upon the instrument. It is not necessary in a pleading to allege that an instrument was executed by an agent and that the agent was duly authorized thereto; it is sufficient to allege its execution by the principal.



C C.-Bulkheads. A A.-Accumulators. M.-Dynamo Machine. R R.-Reservoirs. G G and H H.-Rudders. P.-Weight. E E E.-Tube inclosing the Shafts of the Vertical Screws.

FIG. 1.—THE WADDINGTON ELECTRIC SUBMARINE TORPEDO BOAT.

The plea sets forth a sufficient defense if the term of a United States patent ends at the same time the term of a foreign patent granted for the same invention ends, when it appears that the foreign patent was not applied for until after the domestic patent was applied for, that it was not applied for by the inventor himself but by some other person by his procurement, and that the domestic patent was granted to one who, at the time of the application, was an American citizen, and had made and reduced his invention to practice in this country. The question presented depends upon the meaning and effect of section 4887, United States Revised Statutes, which is as follows:

"No person shall be debarred from receiving a patent for his invention or discovery, "nor shall any patent be declared invalid by "reason of its having been first patented or "caused to be patented in a foreign country, "unless the same has been introduced into "public use in the United States for more "than two years prior to the application. "But every patent granted for an invention "which has been previously patented in a "foreign country, shall be so limited as to "expire at the same time with the foreign "patent, or, if there be more than one, at "the same time with the one having the "shortest term, and in no case shall it be in "force more than seventeen years."

It is not at all material whether the foreign patent is granted to the inventor who makes the application in this country or to some other person to whom he has caused the invention to be patented; the statute expressly covers both cases. Nor is the fact of any importance that the inventor who makes the application in this country is one of our own citizens; because since the act of July 4, 1836, which repealed all former patent laws and established a comprehensive code covering the whole subject, our laws have not made any distinction between our own citizens and foreigners in respect to the privilege of obtaining patents or the conditions and restrictions of the privilege granted, except as to the amount of the fee to be paid and the protection of inventions by caveat The question may, therefore, be simplified by eliminating these immaterial ingredients; and the real inquiry is, whether the section limits the term of a domestic patent to the term of a foreign patent when the application for the foreign patent is not made until subsequent to the application in this country, but the foreign patent issues before the domestic patent. If it were proper to treat this question as an original one it would be necessary first to inquire whether there is any ambiguity in the language of the statute. If there is not, the duty of the court is to give effect to its obvious meaning, notwithstanding it may be thought to make an unreasonable and harsh innovation upon the pre-existing privileges of our own inventors. It is not only the safer course to adhere to the words of a statute, construed in their ordinary import, instead of entering into any inquiry as to the supposed intention of Congress, but it is the imperative duty of the court to do so. Where the meaning of the Revised Statutes is plain the court cannot look to the sources of the revision to ascertain whether errors have or have not been committed by the revisors. (United States *vs.* Boyd, 100 U. S., 508.)

There is no practical difference in the phraseology of Section 4887 and that of Section 25 of the act of July 8, 1870, from which the section is reproduced. The precise point now raised by the complainant, but made with reference to the effect of Section 25 of the act of 1870, was considered by this court in The Gramme Electrical Co. *vs.* The Arnoux & Hochhausen Electric Co., 21 Blatch., 450. It was insisted by the defendant in that case that the complainant's patent expired at the date of the expiration of an Austrian patent, and the complainant took the position that the defense was not tenable because the application for his United States patent was filed before the application for the Austrian patent was made. It was held by Blatchford, *J.*, that the date of the application for the United States patent could not affect the question, and that the meaning of the statute was that the United States patent should expire at the time of expiration of the foreign patent irrespective of the time when the foreign patent was applied for. Judge Blatchford adopted in that case the views of Judge Nixon upon the same question in Bate Refrigerating Co. *vs.* Gillett, 13 Fed. Rep., 553. In the Bate case the question arose under Section 4887, and it was contended that complainant's United States patent did not expire at the date of the expiration of a Canadian patent, because the application for his patent was filed antecedent to the application for the grant of the Canadian patent. The court was of the opinion that it would be wresting the language of the section from its plain and obvious meaning to sustain that position. These decisions have been followed by Bradley, *J.*, upon a subsequent hearing in the Bate case, and by Colt, *J.*, in Bate Co. *vs.* Hammond (First Circuit U. S.).

In view of these adjudications the question should not be considered as an original one. The plea is therefore allowed.

Lamar, Iowa.—The Lamar Electric Light Company. Capital stock, $20,000.

Chicago, Ill.—The Colby Electric Company; capital, $100,000; E. J. Colby and others, incorporators.

San Francisco, Cal.—East Portland Lighting Company. Joseph Paquet, C. B. Bellinger, Jos. Burkhardt. Stock, $130,000

Easthampton, Mass—The Easthampton Electric Co. has been incorporated. Capital, $10,000. J. E. Clark and others incorporators.

Andover, Mass.—The Andover Electric Company has been incorporated; capital, $20,000; W. S. Jenkins and others, incorporators.

Johnson City, Tenn.—The Johnson City Electric Light Works Company have been chartered by J. J. Weiler and others. Capital, $10,000.

Wichita, Kans.—The Wichita Incandescent Light Co. has been incorporated. Capital, $15,000. Cash Henderson and others incorporators.

East Portland, Ore.—The East Portland Lighting Company has been incorporated; capital, $130,000; C. B. Bellinger and others, incorporators.

Easthampton, Mass.—The Easthampton Electric Company has been incorporated here with a capital of $10,000; J. E. Clark and others, incorporators.

Atchison, Kans.—The Atchison Gas, Electric Light and Power Co. has been incorporated. Capital, $300,000. J. R. Pomeroy ard others incorporators.

Camden, N. J.—Brooks Gas Process Company, of Pennsylvania, was incorporated at Camden. The authorized capital stock is $500,000, with $100,000 paid.

Chicago, Ill.—The Electric Train-signal Company, Chicago; capital stock, $100,000; incorporators, Charles S. Owen, William F. Smith, and George M. Shool.

New York.—Certificates of incorporations were filed with the Secretary of State last week by the Primary Electric Company of New York; capital, $240,000.

Tuskaloosa, Ala.—The Tuskaloosa Electric Light and Gas Company; capital, $1,500. The proposition is to erect an electric light plant; incorporators not given.

Chicago, Ill.—The Chicago Smoke Abater and Fuel Saver Company, at Chicago; capital stock, $100,000; incorporators, William D. Smith, Walter M. Carqueville, and W. H. Jenkins.

Wichita, Kan.—The Wichita Incandescent Electric Light Company. Capital stock, $50,000. Directors, Cash Henderson, E. R. Powell, H. D. Heiserman, Henry Lehman, A. C. Dickson.

Chicago, Ill.—The Electric Train Signal Company, of Chicago, was recently incorporated. Capital, $100,000. Incorporators, Charles S. Owen, William J. Smith, and George M. School.

Syracuse, N. Y.—The Empire Gas Manufacturing Company has been incorporated. George T. Hine, T. W. Parmele and Justin Seabert are the incorporators. The capital is fixed at $100,000.

Boston, Mass.—The Walworth Light and Power Company has been incorporated; capital, $15,000; George W. Brown and others, incorporators.

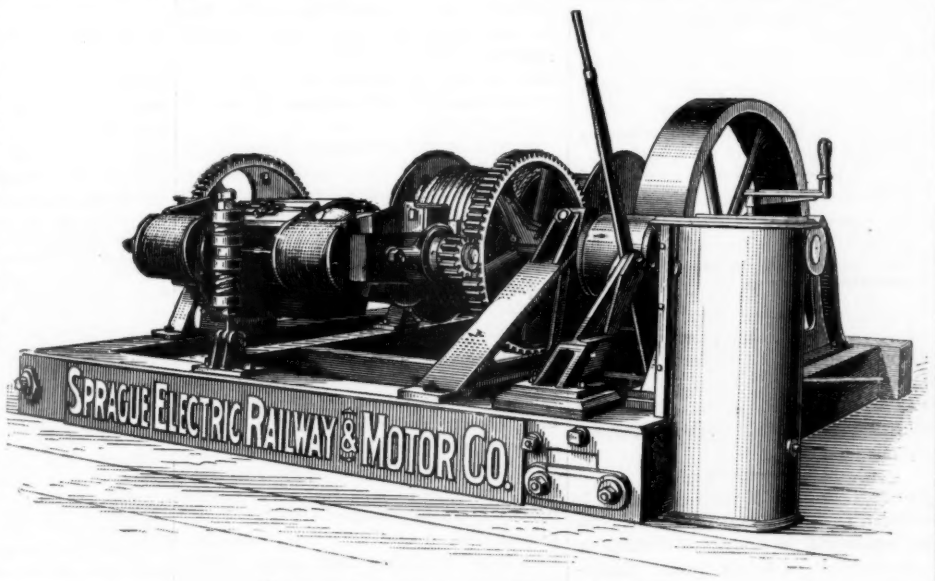
San Francisco, Cal.—Coronado Foundry and Machine Company; stock, $100,000; subscribed, $39,000. E. S. Babcock, Jr., A. Vanderkloat, M. R. Vanderkloat, J. D. Tonkin, J. H. Brook.

San Francisco, Cal.—San Francisco, Cal., Mutual Gas and Oil Company. Stock, $1,000,000. Subscribed, $500,000. Jno. W. Stewart, J. W. Brown, A. H. Hogg, C. G. Nagle, A. Everett Ball.

Camden, N. J.—The Gloucester City Electric Light Company has been chartered in Camden, the incorporators being William J. Thompson and Philip Fowler, of Gloucester, and Gustave Muller, of Philadelphia.

Little Rock, Ark.—The Southern Beall Rubber Company, capital stock $100,000, has been chartered to manufacture rubber goods, belting, paper boxes, etc. S. W. Beall, of Columbus, Ohio, is president, and R. L. Duval, of Columbus, secretary.

Birmingham, Ala.—The incorporators of the Southern District Telegraph and Electric Company, of Birmingham, Ala., are W. L. Woodruff, W. C. Harris, Jr., and E. W. Linn, with W. L. Woodruff as president, and W. C. Harris, Jr., as secretary, treasurer and general manager.



HOISTING APPARATUS WITH MOTOR ATTACHED.

Atchison, Kan.—The Atchison Gas, Electric Light and Power Company. Capital stock, $300,000. Directors, J. P. Pomeroy, of Boston, Mass.; A. G. Otis, I. P. Brown, E. S. Mills and J. M. Chisham, of Atchison.

New Haven, Conn.—A wire company with $10,000 capital has been organized in New Haven, with H. C. Warren, of Warren & Co., bankers, as president, and Wallace Bradley, late secretary of the Whitney Arms Company, as secretary and treasurer. The company will occupy a part of the S. H. Barnum foundry on Whitney avenue.

Portland, Me.—The New England Gas, Light and Heat Company organized at Portland with a capital stock of $300,000; Roscoe H. Thompson, president, Samuel G. Lane, treasurer. The purposes of the corporation are the manufacturing of gas for illuminating and heating purposes, and the use of any other system of lighting and heating as may seem advisable.

Newark, N. J.—The Benjamin Atha & Company; capital stock, $750,000. The incorporators are Benjamin Atha, John H. and Robert F. Ballantine, William Clark, and George H. Hughes. In connection with the new steel company, the Atha Tool Company was incorporated with a capital of $100,000, Mr. Atha retaining 960 shares. The new company will operate the works on the Passaic as well as the newly acquired plant in Jersey City. Mr. Atha will start at once to build a new steel works, with a capital equal to that of the Atha Company.

OUR LONDON LETTER.

(Special Correspondence.)

Holders of shares in road car companies are beginning to feel uneasy at the prospect of the long talked of experiments in electrical traction on the underground railway being at length carried out. The Metropolitan District Railway Company are said to have arranged with the Electric Traction Company for the trial of an electric locomotive, which is to carry accumulators capable of supplying power equal to that of the steam locomotives at present in use. It will strike all practical engineers that in a tunnel where bare overhead wires could be fixed without risk or inconvenience, some system which provided for the supply of the current from without would be preferable to one which necessitates the haulage of a battery of sufficient power to start a heavy train. I am told, however, that if the experiment proves to be a success mechanically, a system of overhead conductors will ultimately be adopted with a view to economy. Londoners are beginning to think that it is high time some plan was hit upon which would enable them to travel over the line in summer without running the risk of being half suffocated. The increased passenger traffic which would result from the adoption of such a plan would unquestionably compensate for any slight sacrifice of economy, and there is no longer any doubt that on the western side of the Atlantic, electric traction has been made a practical success.

The important action brought by the Edison-Swan Company against the Anglo-American Brush Corporation for infringements of their incandescent lamp patents is being heard before Mr. Justice Kay. The patents in question are (1) that of Edison, No. 4,576, of November, 1879, and (2) the "flashing" patent of Cheesborough (the agent of Sawyer-Man), No. 4,847, of November, 1878. In the action brought by the Edison Company against Woodhouse and Rawson, on the same patents, judgment was given for the plaintiffs in the Court of Appeals, though the decision of the three judges was not unanimous.

Lord Crawford's Bill for amending the Electric Lighting Act of 1882, has been under discussion by a select committee of the House of Lords, during the past week. The professed object of this amendment is to relieve the electric lighting industry from those disadvantages which have hitherto made it impossible for it to compete with gas, except as a mere luxury. The measure proposes to grant freedom to electric supply companies to make their own terms with the local authority, and thus to save the heavy expense and delay of obtaining a special Act of Parliament. It stipulates that in five years all cables shall be placed underground, and that the supplying company shall pay an annual rate (not exceeding £20 per mile) towards keeping the streets in repair.

In case of compulsory purchase of the undertaking by the local authority, the price to be paid is to be decided by the average market value of the shares during the previous five years.

Lord Crawford says he believes that the passing of this bill would lead to the investment of large sums of money in the manufacture of plant, and in the laying of mains, and that employment would be found for at least 40,000 men. This, however, is considerably more than the most sanguine promoters of electric lighting schemes venture to hope; moreover, the bill is so crowded with detail that there is no chance of its becoming law this session, and a petition, signed by all the leading electric lighting men, has been presented to the House, in favor of bringing on Lord Thurlow's bill as a temporary measure for the relief of the industry, while Lord Crawford's proposals are being moulded by discussion into a thoroughly practical form. Lord Thurlow's bill is of modest dimensions, and the main point in it is the substitution of 42 years for 21 as the period at the end of which the local authority may compel the company to sell its business.

TRANSFORMERS VS. ACCUMULATORS.

Members of the Society of Telegraph Engineers who attended carefully to the paper on Transformers *vs.* Accumulators, and to the discussions which followed it, will feel that although Mr. Crompton dealt with hard figures, and offered to back them by carrying out any work at the prices named, yet the weight of experience in America which could be brought to bear in favor of the A. T. (or alternating system) against its rival, the B. T. (or battery transforming system), did more than turn the scale in favor of the former. There is no longer any doubt that alternating current machines can be run in parallel with one another. This does away at once with the objection to the A. T. system, that large machines must be run at a very low efficiency on circuits where the normal current is very much below the maximum, and although under special circumstances the B. T. system may be preferred, on the ground of a slightly increased reliability, as a general rule promotors of electric light schemes will hardly care to go in for the considerably greater outlay in the present uncertain state of the lasting powers of secondary batteries. Prof. Geo. Forbes, who had just returned from America, was one of Mr. Crompton's most severe critics, and spoke of what he had seen of the success of the Westinghouse system in the States. He then set to work to pick holes in Mr. Crompton's figures, until they could no longer be recognized, reducing the estimated first cost of the A. T. system from £57,440 to £34,140 for a 600 Kilo watt station. The discussion is now at an end, but Mr. Crompton will read his reply on May 17th. It will be interesting to hear what scientific societies in America can make of this vexed question.

London, England, May 8, 1888.

Electric Incline Mining Hoist at Aspen, Col.

Accompaning is an illustration of one of the electric incline mining hoists of the Sprague Electric Railway and Motor Company, now in successful operation in the Veteran Tunnel at Aspen, Col. This is but a portion of the equipment, as other mining hoists and standard machines are being installed for various mining purposes. The motors are operated from a special 500 volt power plant driven by water power. The dynamos are situated about a mile and a half from the end of the tunnel. This is but one of the numerous successful power plants installed by the Sprague Company.

—— The Georgia Electric Light Company will increase their plant at Atlanta.

—— The East Portland, Cal., Lighting Company proposes putting electric and gas lights.

—— The Georgia Electric Light Company, of Atlanta, will increase their capacity. They will erect a new brick building, two stories, 110x60 feet, and put in 120 horse-power boiler and 100 horse-power engine to increase their capacity to 350 arc and 800 incandescent lights.

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☞ No attention will be paid to communications without the *name and address of the writer.*

We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Timothy W. Sprague, Massachusetts Institute of Technology, is our representative at Boston, Mass.

Mr. C. C. Haskins, 118 La Salle Street, Chicago, Ill., represents the REVIEW in the West.

NEW YORK, MAY 26, 1888.

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The Fellowcraft Club has been organized in New York, and is composed of the leading men in the artistic and literary branches of New York journalism. We think a club of this kind, in which the dignity of the calling is always upheld, should meet with gratifying success.

A sensible editorial in the New York *Star* of Sunday takes the ground that before the wires of all the electric companies are forced underground, adequate provisions for their distribution above ground, so as to supply customers, should be made. This is just what has not been done.

The United States Electric Lighting Company, whose patent interests are in charge of Messrs. Duncan, Curtis & Page, has been uniformly successful in its patent suits. The attorneys of this company in the Wallace decision have again kept unbroken the chain of favorable decisions, and have scored the honor that always accompanies an ably-contested legal victory.

The *Home Monthly* rises to announce to the world of homes that "the ELECTRICAL REVIEW comes crisp and fresh each week, full of information in its special department. It will keep you posted in the progress electricity is making, as applied to the various uses. It is published at 13 Park Row, New York. Price, $3.00 per annum."

The sensible conclusions of Prof. Geo. W. Plympton on the underground question appear in another column. Prof. Plympton is president of the Brooklyn Subway Commission, and has made an exhaustive study of the question in this country and abroad, and speaks with a thorough understanding and practical knowledge of the situation.

For the purpose of investigating the various systems of illuminating cities by electricity, the Committee on Gas, of the city of Allegheny, Pa., has just concluded visits to a number of cities, including New York and Philadelphia. Mr. J. R. Stayton is Chairman of the Committee. Mr. Robt. McGonnigle and Mr. T. Carpenter Smith, of the Allegheny County Light Co., accompanied the Committee. While in New York they visited the Electric Club and listened to the phonograph.

The New England Electric Exchange is announced ready for work. Copies of the Constitution will be sent to all desiring to become members of the Exchange. Correspondence should be addressed to Henry B. Cram, secretary, 48 Congress street, Boston. In the announcement just issued the Exchange states that "after October 1st, 1888, the Fire Underwriters will not insure any property where electric light or electric power is used, nor pass any new installations, unless the party operating the plant or making the installation has obtained from this Exchange a certificate of license."

The committee on insulation and installation, appointed by the National Electric Light Association, held a meeting in this city last week, Prof. Elihu Thomson, Dr. Leonard Waldo, Dr. Otto A. Moses, Prof. E. L. Nicholls and Mr. Geo. Hamilton, being present. A plan was mapped out, work assigned, and the preliminaries were made for an exhaustive and valuable report to be made at the next meeting of the Association. This is an important committee, composed of able, impartial gentlemen, and their report will be looked for with interest.

A GLASS CONDUIT.

For the n—th time (in a formula where N stands for infinity), glass has again come to the surface as an insulator for underground work. When we old people were young, and electricity was in its swaddling clothes, we were taught that glass was one of the very best insulators known; and we can all remember, if we stop to think, how the good old professor in gold-bowed spectacles carefully polished up the leyden jars, to make them hold the charge of electricity which the wheezy and rickety cylinder machine evolved, if it was a tolerable dry and cold day.

One cannot remember everything, and the most important part of a scientific showing, or the nub of a joke is often forgotten, while the balance is indelibly impressed on the tablets of memory. Every one remembers that glass is a non-conductor, but nearly every one forgets that it is hygrometical, and never tires of accumulating water on its surface by condensation.

A doctor somewhere in Pennsylvania has invented a method of underground conduit, in which the wires (telegraph and telephone) are laid in grooved plates of glass, the interstices filled with pitch, laid up like layers of jelly cake, until you have as many in as you need. The whole is then placed in a long coffin, and the latter is buried in cement. There are no religious services; these come later, when the wires give out, and the council refuses to allow the company to disinter the corpse. At intervals of twenty-five feet or so each wire is brought out through a right angle groove in the glass, so that an inch and a half of the wire is exposed, for cutting and testing. The immense value of the invention can only be appreciated by those who have had experience with wires in this preserved condition, and to know from the reporter that "the results of twenty years' experiments with electricity are embodied in this device," and "the convenience of this plan of connecting is greatly increased by the accurate registry of the wires which the discarding of all coils facilitates." This is a case where the sermon precedes the text.

THE EDISON ELECTRIC LIGHT CO. VS. UNITED STATES CO.

The decision of Judge Wallace in the Edison suit against the United States Electric Lighting Company, which is printed in another column, is undoubtedly a very important one, and of great interest in electric lighting circles.

In May, 1885, as readers of the ELECTRICAL REVIEW will remember, the Edison Company commenced a large number of suits on its patents in the United States Circuit Court, in New York. Some thirty of these suits were brought against the United States Company on the principal Edison patents on the carbon filament lamp, holders and fittings for lamps, dynamo machines and regulators. The defendant company took the preliminary objection that the Edison patents had expired before the suit was commenced, because Mr. Edison had taken out foreign patents with short terms for the same inventions before the United States patents were granted, and that these foreign patents having expired, the United States patents had expired with them under the provisions of Section 4887 of the United States Revised Statutes.

Under a previous decison, the Supreme Court decided that the Court of Equity in which the suits were brought had no jurisdiction if the patents had expired, and the defendants took this objection by what is technically known as a "plea" which raised this question alone without going into the question whether the patents, aside from this, were valid or not.

This question was not brought before the court for argument until April of this year, when it was very exhaustively argued before Judge Wallace, by Senator Evarts, Mr. Seward and Mr. Tomlinson, for the Edison Company, and General Duncan, Mr. Wetmore and Mr. Betts for the United States Company, the argument occupying two days. One of the suits, that on Mr. Edison's patent No. 263,140, in which Judge Wallace has just rendered his decision, was selected as a test case.

Judge Wallace now decides in substance that the Edison United States patents expired with the foreign patents and that the plea must accordingly be allowed. Whether the Supreme Court will take any different view of the law is, of course, a matter of conjecture, and in any event no decision can be reached there for some time to come.

It is to be regretted that the controversy should have turned on a technicality like this rather than on the merits of the patents, but the defect in the patents seems to have arisen from too much haste in filing the applications abroad, as no limitation need be incurred when proper judgment is exercised in taking out the foreign patents. The remedy is to have all foreign applications made the same day as the issue of the patent here.

NOTE ON THE TESLA ALTERNATING CURRENT MOTOR.

BY DR. LOUIS DUNCAN, JOHNS HOPKINS UNIVERSITY.

TO THE EDITOR OF ELECTRICAL REVIEW:

The Tesla alternating current electro-motor has attracted so much notice in the last week or so—a paper describing it having been read before the Boston Society of Arts, another before the American Institute of Electrical Engineers, and a description in the ELECTRICAL REVIEW—that one is naturally led to inquire as to its possible advantages. The description published in this journal is the only one I have seen, and if one is to accept literally the statement contained in it, the Tesla motor has an unprecedented field of usefulness.

We may, for our present purposes, divide motors into two classes: Continuous, in which the armature coils are unsymmetrical with respect to the poles, and which, therefore, give a practically constant torque, and alternating motors, in which the armature coils are symmetrical with respect to the poles, and which, therefore, give a torque varying both in magnitude and sign during a period of the counter E. M. F. The Tesla motor belongs to this latter class.

In every motor the torque is equal to the rate of change of lines of induction through the armature circuit for a small angular displacement, multiplied by the armature current, or

$$\frac{dm}{dt} \mathrm{I}$$

In the Tesla motor the first of these terms is greatest when the coil is opposite a pole and the field currents have their greatest amplitude; it is zero at a point about 45° from this, supposing we neglect armature reactions. It depends on several things; the E.M.F. which determines it is due to changes in the number of lines of force passing through the armature circuit caused by (1) changes in the field currents; (2) the motion of the armature. The current depends on these E. M. Fs., and on the reduced self-induction and resistance of its circuit. The motor can only do work when the first cause of E. M. F. is the greater, for a current in the direction of the ordinary counter E. M. F. would stop the motion. In some parts of a revolution the two E. M. Fs. work together, retarding the motion; in others, the induced E. M. F. produces a current causing the motor to revolve. It is impossible for me, with only a meagre description of the principles of the machine to give an idea of the relative magnitudes of these effects. Some of the results however are the following: Having given a definite number of reversals of the dynamo, there are a number of speeds, multiples of these reversals, at which the motor will govern itself when it is doing a certain amount of work. At one of these speeds, depending on the construction of the motor, the output will be a maximum. Now I see the statement that "there is no difficulty whatever attendant upon starting the motor under load." I cannot reconcile this with above facts. That the torque for a smaller number of revolutions than ordinarily used, might be greater, one can readily see, since the counter E. M. F. is less in proportion to the induced E. M. F., but it must be remembered that for certain speeds, even the induced current, would tend to stop the motion; how the motor is to pass these critical speeds I do not see. Again, if the maximum load is suddenly thrown on while the motor is running at its proper speed. Then, if the inertia be great the motor will fall behind its point of maximum work and either stop or take up some slower speed.

What the possible efficiency and output of the motor may be only experiment can tell. I have shown* that the output of an ordinary alternating motor is equal to that of a continuous current motor, supplied with a corresponding E. M. F. The efficiency might be great, but it has the disadvantage that about the same current flows for no work and maximum work, so for light loads the efficiency can hardly be very high.

With our present knowledge of alternating currents, it is useless to attempt to calculate from the simple though misleading assumptions ordinarily made, the output, conditions of maximum work, etc., of this machine. Experiment alone can determine its value, and one properly conducted and interpreted set of experiments should enable us to judge both the merit of the invention and its best possible form. I cannot see, however, how, in the form described in the last issue of this journal, the motor can work under conditions of a suddenly varying load as satisfactorily as continuous current motors.

*Inst. Elec. Eng'rs, February, 1888.

OUR CHICAGO LETTER.

(Special Correspondence.)

The City Council of Chicago has had much to do in electrical matters of late. There were electric light ordinances, franchises, restrictions, appropriations. There were legal points to be decided in the case of the Chicago Telephone Company, and the matter of permitting removals of wires for subscribers who changed their places of business on May 1st. There was the river and bridge telephone dispatching, and the question of uniting the city and county building plants under one control, and finally the suggestion from the proper authorities that the principal places of public amusement be connected electrically with the Fire Alarm office, so that no time should be lost in getting to any of these buildings in case of an emergency. It did look as if the city's solons had their hands full, but the sky is clearing. The Supreme Court has probably pretty thoroughly fixed the telephone franchises which were asked by sundry and divers opponents of the Bell system; the river question is being calmly discussed *pro* and *con* by the parties interested, with an excellent prospect of satisfactory and speedy solution. The tug captains are a little refractory, but the agents of transportation lines are on the side of "decency, justice and equity," and can see that those who patronize the vessels of their various lines are parties who do not like to be bridged. And thus do we see exemplified that wonderful provision of nature, "the eternal fitness of things." One of the principal transportation companies is the Anchor Line, and Mr. John Cordon, agent, suggests that the big propeller lines will all obey the vessel dispatcher, provided he is given plenary powers to close and open the bridges when street traffic requires the former, or will permit the latter action.

The Chicago Edison Company has been granted a franchise to operate a central plant in the town of Lake, under certain proper restrictions, such as getting to work within a reasonable time, etc.—the usual guarantees. It is also understood that so far as this can be made available, the company will use waste steam for furnishing caloric in the immediate vicinity of the plant.

Messrs. Leonard & Izard, general agents of the various Edison manufacturing concerns, and special agents and constructors for the Edison Light Company, have just issued a handsome little brochure containing "a list of Edison plants in Illinois, Wisconsin and Iowa, with testimonials from users." The list shows 91,600 Edison lamps now in use within the territory named.

The doctrine of evolution is being illustrated by the changes in the Chicago Telephone Company's offices. The concentration of nearly all the business portion of the city into one huge exchange room, has annihilated two exchanges completely, will wipe out a third, and divide a fourth, leaving only the residence lines and the family grocers, bakers and butchers. All of these can, as before, be reached through the connecting lines, but the immense advantage gained lies in the greater ease and reduced time required to obtain a business connection. Heretofore the number was several times repeated before it finally struck bottom, and the uncomfortable citizen too often lost his temper when asked for the third or fourth time, "What number do you want?" The multiple switch-board system will also do away with the great annoyance of being rung up forever by the wrong party.

Mr. Chas. H. Wilson, the superintendent, said the other day to a reporter:

"The great trouble which has been expected, but which has not so far put in an appearance, is that there might be some error in the 250,000 new connections of various kinds which have been made in the remove. So far all the errors made are supposed to have been detected, but it is the possibility that they have not which causes a little feeling of anxiety.

"It is just like a printer learning the case,' said Mr. Wilson, as he stood behind an operator and watched her looking for '1827," counting up from the side till she got to the right spring-jack for the plug. "You see she started over to the wrong side first. That was the way it was on the old table. She'll learn it before the day is past. When the thing works right there will be no necessity of repeating the number you want two or three times. The operator who answers your ring will have full charge of making all the connections, and, when she doesn't actually make them herself, will repeat the number without the subscriber being bothered. In this way the operator becomes quite well known to her own circle of subscribers, and they think she is the quickest and best of the lot, and naturally she takes a pride in her work. The new outfit cost us $75,000, but it is worth it in the gain of improved service."

The new system is working well, considering everything, and the results are giving daily evidence of the ability of that gentleman, and the efficiency of the multiple system.

Notices are out for the meeting of the Electric Club on the 21st, at which Mr. Elmer A. Sperry will further elaborate the discussion on the general subject of "The Continuous *vs.* the Alternating Current," by reading a paper on the "use of motors on alternating current circuits."

Mr. George H. Bliss will, in the near future, contribute a paper on the continuous current side, and there is a possibility that still another paper will be given by a non-resident electrician of more than local fame as a scientist and demonstrator, whose name is at present withheld because of the prematureness of the suggestion.

Another new theatre will be opened on the west side on the 24th inst., which is nicely fitted up with a couple of hundred incandescent lights. The work has been done by the United States Company, and the arrangement is excellent for convenience as well as for light effects. The house is a remodeled edition of what was formerly known as Grenier's garden, and will be conducted on the same moral plane as are the first-class theatres, and the manager says none but first-class companies and first-class patrons can occupy either the stage or auditorium.

The Edison people are doing the temporary wiring at the Auditorium for the Republican presidental convention, which will meet in Chicago in June.

There is a first-class rumpus on hand between the electrical plant engineers and the Royal Leaguers. The Supreme Council has decided that running a dynamo is extra hazardous, and says that such parties cannot be accepted by the lodges. The Supreme Scribe says that only first-class risks are taken, and that if it can be shown that running dynamos is not extra hazardous, these engineers will be admitted to membership, but from present appearances, the linemen and all of that class of employés will be barred out.

The New Haven Clock Company is being sued by Leroy B. Firman and the Western Electric Company for infringement of the telegraph system of signal boxes patent. The patent which governs the principle contained in these boxes, and which is quite valuable, is numbered 192,644, dated July 2, 1887. It is the same principle which is used by the Police Telephone and Signal Company and other signal systems in general use.

Visitors at the Club during the past few days have been Henry B. Slater, of Detroit, Mich., who stopped over on his way West with an electrical system of low grade ore reduction; Dr. A. F. Freeman, patent expert, from Washington; Norman McCarty, general managing agent of the Baxter Electric Manufacturing and Motor Company, besides the usual quota of carbon, wire and oil men, who are as regular as are non-magnetic watches in their revolutions.

Chicago, May 21, 1888. C. C. H.

—— The most *blasé* fish that ever wore scales and shunned a baited hook will draw near in thrilled wonderment to an electric light submerged in his native element, and so be allured to his fate. The United States steamer "Albatross" has been fitted with electric fishing lights, for the conduct of scientific research, and preliminary experiments with these lights have revealed the fact that the curiosity of fish to investigate this unwonted radiance, brings them to the light in shoals. The halt and the maimed of the *pisces* family turn out to see this wonder, and to capture them and all the rest is an easy task. A pocket dynamo and a scoop-net may become the successors of the can of angle-worms, the rod and the minnow bucket, but we fear the fisherman's enjoyment will be lessened.

OUR BOSTON LETTER.

(Special Correspondence.)

The first of the informal Wednesday evening talks before the Electric Club was given last week by Mr. H. C. Spaulding, who spoke on the "Influence of the Institute of Technology on Electrical Progress." The paper was an interesting one and brought out a most instructive discussion. This Wednesday evening paper will now be made a feature of the club's entertainments. Saturday evening was observed as "social night" and a large number of club members enjoyed a most social time. Next Saturday Mr. G. W. Mansfield will read a "Sketch of Elevated Railways and their Adaptation for Electrical Propulsion."

Mr. Axel Exstrom, who has been with the Thomson-Houston Company in Lynn for the past year or two left last week for Stockholm, where he will be in the employ of the Thomson-Houston International Co. On the eve of his departure his many friends in Lynn gave him a complimentary banquet, which was a most enjoyable affair, and gave Mr. Ekstrom a most cordial proof of the esteem in which he is held by his associates in the company.

The Ball Electric Light Company claims to have made an improvement in electric lighting, the invention consisting of a new 1,000 candle power arc lamp requiring four amperes of current at a pressure of fifty volts.

The Panama Electric Light Company, which has lighted Colon successfully, has now turned its attention to Panama itself. Mr. Charles W. Grant, of the Thomson-Houston Company, arrived there recently to superintend putting up the plant and place it in good running order. One arc dynamo and 1,000 lamp incandescent alternating dynamo will be put in running order at once.

The East Side Railway Company, of Breckton, has decided to adopt the Thomson-Houston system on its road, and the same system will be used on the new Salisbury Beach railway at Newburyport. T.W. S.

Boston, May 21.

Personal.

Mr. H. A. Cleverly has taken the Philadelphia agency for the Baxter Motor. His office is 1018 Chestnut street.

Secretary Garfield, of the T.-H. Company, came over from Boston last week, and found time to visit a few of his friends via telephone.

Mr. James Gilliland, of Adrian, Mich., a large manufacturer of general electrical goods, was a New York visitor last week. He is a brother of the well-known inventor, Mr. E. T. Gilliland.

Mr. Frank Ridlon delivered an address on electric lighting before the Woburn, Mass., Board of Trade. The advantage of this illuminant, it goes without saying, did not suffer at the hands of Prof. Ridlon.

Mr. W. J. Hammer, of the Edison company, has arranged to present a number of interesting electrical novelties and experiments at the Ohio Valley Centennial in Cincinnati, and will make his headquarters in that city for the next few months. What Mr. Hammer undertakes in this direction will be a success.

Howard Milton Linnell, the well known dynamicer of Hartford, returned last week from a successful trip to Buenos Ayres, S. A. The trip has had a very beneficial effect on Mr. Linnell. A number of his New York friends were remembered with South American gifts, such as fragrant native cigars and silver-headed canes.

Lieut. F. W. Toppan, U. S. N., is the manager of the phonograph works at Bloomfield, N. J., and will also have charge of the new and extensive phonograph factory that is being constructed on Mr. Edison's property near his laboratory. This young and talented naval officer has always taken a great interest in electrical matters, and will be a valuable man in the development of the phonograph business. The new factory will be 600 feet long by 75 wide, and will give employment for a large number of workmen. It will be finished in about two months.

Comments of Interested Attorneys on Judge Wallace's Decision.

In electrical circles last week comments on the decision of Judge Wallace, which we publish in full in another column, were quite generally heard. It was considered by one side as definitely settling the matter, by the other as only the skirmish.

Mr. J. C. Tomlinson, attorney for the Edison Company, said that the general idea of the scope of Judge Wallace's opinion was incorrect. The Judge "did not pass on the question as an original one or express any opinion as to the law, holding that he is bound by the decision in other circuits to the effect that a patent issued here on an invention patented abroad expires with the foreign patent. The plea sets up an Austrian patent for one year. The complainant asserts that the patent is for fifteen years. Proof as to the facts will have to be taken. If the Court should hold finally that the Austrian patents are for fifteen years, the defense would entirely fail."

Mr. Leonard E. Curtis, the leading representative of the United States Electric Lighting Company in the matter of patents, and who is one of the best informed men in the country in the matter of patents relating to electric lighting, was of course well pleased with the decision of Judge Wallace, and thought that it would have a much wider scope than at first appeared.

General Duncan, in discussing the decision, said that it was evident that the Edison Company regarded the question involved in the plea as a vital one, from the character of the counsel whom they employed. "The patents involved," he continued, "are those under which the Edison Company have claimed that they had the right to control the incandescent lamp in all of its forms. The decision of the court sustains the defendant's plea on all points raised. The practical effect of the decision is that the Edison Company will be unable in any event to obtain injunctions under their patents." General Duncan said, that in point of fact some of the patents had expired because of the expiration of Italian and other patents. The Austrian patent was only one of many.

Electric Welding and Melting in Europe.

The Dresdner Bank is stated to have acquired the right of working the German patents for the invention of MM. N. de Benardos and St. Olszewski, of St. Petersburg, while the firm of Rothschild, of Paris, is reported to have acquired the exclusive right of working the patents for France, Belgium, Spain, Italy and Austria. The invention referred to relates to a method of working metals by the direct application of an electric current, and more especially of forming alloys by the same means, and has been described in the REVIEW. The preliminary trials that have taken place at St. Petersburg and at Crecil, near Paris, are said to have turned out successfully.

—— A force of thirteen Philadelphia and Reading Railroad linemen, under Foremen C. F. Glaze and W. C. Fry, completed on Thursday afternoon a telegraph line of twenty-one and a half miles along the Chester valley Railroad, from Bridgeport to Downingtown. Twenty-two days were consumed in the construction of the line.

—— The electric light plant at the Gas-light and Coke Company's factory, Toledo, Ohio, is a model of its kind. The machinery is run by two 150 horse-power engines, manufactured by Barney & Kilby, Sandusky. It is said that the company has machinery for lighting the entire city. The works are run by the surplus heat from the gas works.

—— The Thomson-Houston Company reports the following new installations of arc lights: Scranton, Pa., 50; Dakota Building Association, 35 (isolated plant); Sioux City, Iowa, 35; Lawrence, Kan., 70; Madison, Wis., 30; North Danville, Va., 30; St. George, S. I., 100; Reidsville, N. C., 50. And the following increases: Toledo, Ohio, 50; Houghton, Mich., 30; Cambridge, Mass., 45; Ware, Mass., 20; Orange, Mass., 20; Ashland, Wis., 50; Augusta, Ga., 50; Northern Electric Light Company, Phila., 50.

TELEGRAPHIC

.... Rockland, Me., is to have a fire alarm telegraph.

.... The Oroville and Beckworth Railroad Company, California, just incorporated, will construct a telegraph line from Oroville to Beckworth.

.... The Gamewell Fire Alarm Telegraph Company has closed a contract with the city council of Mobile, Ala., and will put their system in operation as soon as possible.

.... The fire alarm system in Charleston, S. C., is about to be put into operation, and the city has had a large number of cards containing the location of the fire alarm boxes printed for distribution to the members of the several fire companies.

.... The sending (technically known as "writing") of operators possesses as much individuality as does their penmanship, and old friends frequently recognize each other in this way. Many, through improper instructions, are unable to form their letters correctly, and it requires perfect familiarity with their eccentricities of style on the part of those receiving from them. Poor writers generally imagine that the fault is in the receiver. One lady operator invariably asks receivers who are unable to read her peculiar Morse: "Do I write too fast for you?" Through the exertions of an operator of this class, a message designed for Lime Rock, Conn., wandered up and down that State one day looking for Limerick.

.... The telegraph scene in "Across the Continent" is a source of ridicule to telegraphers. The star of the play is, in one scene, telegraph operator at a small station on the Union Pacific Railroad, and is surrounded with hostile Indians. He telegraphs for help in an unintelligible jargon of dots and dashes, translated by him for the benefit of the audience. As a general thing the operator behind the scenes does not know any more about telegraphy than the one on the stage, but his jumble is read to the breathless audience, as intelligence that help is coming. Occasionally a practical telegrapher is employed behind the scenes, and he seldom fails to take advantage of the situation. On one occasion the sounder ticked off: "Say, Oliver, let's take a drink." Which was received by "Oliver" with: "Thank God! we are saved!"

Manufacturing Notes.

Mr. Jarvis B. Edson, sole manufacturer of the Edson gauges, has removed from No. 91 Liberty street to new offices at 145 Broadway and 86 Liberty street.

Chas. A. Schieren & Co., report recent sales of their leather link belting to the following electric light plants for use on dynamos: Florence Electric Light Plant, Florence, Ala.; Scranton Illuminating, Heat and Power Co., Scranton, Pa.; Thomson-Houston Electric Co., Lynn, Mass.; Narragansett Electric Light Co., Providence, R. I.; Sheffield Electric Light Works, Sheffield, Ala.

The New England Wiring and Construction Company have just closed what will probably be one of the largest contracts of the year. They will install the incandescent light in the large new building of the Continental Clothing House, corner of Washington and Boylston streets, requiring about 1,000 lights. An error of the types last week reported this firm as wiring the Hotel Brunswick on Columbus avenue. The Hotel Berwick is the place.

The New Haven Clock Company has opened a branch in Chicago to handle the business on a similar scale to that in New York. The location is at 315 Wabash avenue. Mr. Noyes, of New York, has just returned from Chicago where he established the new house, and is greatly pleased with outlook. Mr. H. G. Smiley, formerly secretary and manager of the Electrical Protective Supply Company, of Chicago, has taken charge of the electrical department.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

The local electrical circles have been enlivened this week—at least the telephone part of them—by the visit of Mr. F. B. Knight, representing the American Bell Company. Mr. Knight has been traveling throughout the central west and the southwest engaged in the work of "knocking out" infringing exchanges. The work has certainly agreed with him, if one may judge by his appearance, for he is bronzed and healthy to a remarkable degree, and retains his pristine liveliness in talk and actions. He has been paying particular attention to the exchanges in Kansas and Arkansas. The infringers prospered in these two States until the Supreme Court decision settled the matter. Exchanges had been established in Maryritle, Kingman, Lyons, Sterling, Marion and Hutchinson, Kans., and were doing a good business. Now, all have been abandoned, except those in Marion and Hutchinson. The manager of the Marion exchange is endeavoring to effect the conversion of his establishment into a regularly authorized Bell exchange, and is being allowed a little rope in consequence. Should he fail in that, however, he will be closed up with a sudden snap. Hutchinson is disposed to be pugnacious, and legal proceedings have been instituted. The Hutchinson Company claims to be using a telephone invented and in use in India, several thousand years before Professor Bell was born. In Arkansas exchanges had been established in Harrison, Morrillton, Fort Smith and Eureka Springs. All of them surrendered without a struggle. Harrison is away up in the mountains, forty miles from any railroad, yet a fair exchange had been established there, and most of the people who were using the telephone and had an interest in the exchange had never heard of the Bell instrument. It took Mr. Knight all day to drive to the place from Eureka Springs, but he "got there," and came away with the exchange's scalp.

Mr. Knight is very much captivated by Kansas City's push and energy, and thinks of spending a month or two here this summer.

The Kansas City telephone exchange now has more patrons than ever before. There are 2,383 telephones in use, and orders for twenty-seven more, making in reality 2,410. When the number reaches 2,500, Superintendent Smith says red will be a very weak color in comparison with the color with which he will paint the western horizon. At the present rate it will be just about a month until the desired number is reached. The company is devoting its energies now more especially to the extension of the cable system. Five thousand feet of 100-conductor cable are being put in now, and 15,000 feet of the same have been ordered, and will be put in as quickly as possible. The company has introduced a new scheme here in connection with the big office buildings. Arrangements are made with the proprietors and contractors while the building is being constructed, to wire it for telephones. The building is thus connected directly with the exchange by cable. When any office in the building wants telephone connection, all that is necessary is to put in the instrument. This saves a great deal of time, annoyance and expense to both the patron and the telephone company. The Nelson-Weller, the Baird, the Security, the Beals and other buildings have already been fitted up that way, and the American Bank building, the New England Mutual Life Insurance building, the Gibraltar, the New York Life Insurance building, and all the other large buildings are being similarly fitted.

The Western Electrical Construction Company is busy now putting incandescent electric light plants in the large office buildings in the city. It has been very successful in securing contracts, and is putting in the following lights: Board of Trade building, 1,500; American Bank building, 1,800; New England Mutual Life Insurance Company's building, 500; Gibraltar building, 300; Keith & Perry building, 850; Warder-Grand Opera House, 1,500; Kansas City Club House, 250; Metropolitan Street Railway Company's power house at Twelfth and Charlotte streets, 150. The contract for lighting the building being erected by the New York Life Insurance Company, has not yet been let. This building will require probably about 2,000 lights.

The Inter-State Electric Company and its able manager are constantly on the go. Mr. Bossart is paying a great deal of attention to Kansas territory, and is working up lots of business in that locality. Kansas City is not neglected either, and a large force of men is kept constantly employed putting in the storage batteries.

The Kansas City Heat, Power and Light Company has begun laying its mains for the conveyance of steam to any part of the city, to be used for heating and for power. The company intends to pay particular attention to the application of their steam to the operation of electric motors of all kinds.

The benefits and annoyances, the beauties and disagreeableness of injunction law has been experienced lately by western electric companies in a somewhat remarkable degree. To begin, the American Electric Light Company was recently organized in this city, an avowed rival of the Kansas City Electric Light Company. It went right ahead, incorporated, obtained its franchise, and went to work one Sunday erecting poles for its wires along the streets already wired by the Kansas City Electric Light Company, beginning on Sunday in the hope of getting so far along before the old company would find it out, that matters could not be interfered with. It counted without its host. Bright and early the next day the Kansas City Company instituted proceedings for an injunction against the American (which has since been granted), prohibiting it from wiring streets already occupied by the Kansas City Electric Light Company. This injunction had hardly got cold when the Western Union Telegraph Company followed suit, and the American Electric Light Company began to think injunctions a burden; but it was not to escape this easily. The Missouri & Kansas Telephone Company obtained a third injunction against the American, and the latter is now wildly in favor of the passage of the subway ordinance. The grounds on which the injunctions were asked was the same in each of the three cases, the danger and confusion that would result from the wires being so close together.

While all this was going on in Kansas City, injunctions were also flying back and forth in Omaha. Here the Pacific Mutual Telegraph Company and the Nebraska Telephone Company succeeded in enjoining each other from paralleling, cutting or entangling each other's wires or interfering with them in any manner. This condition of affairs, however, is not as bad as the situation of the American Company in Kansas City. The American is inclined to be bitter, and it is very free in charging that the Kansas City Electric Light Company has erected poles and strung wires simply to pre-empt streets against it, and that these wires are not used and were never intended to be used.

The American's hope of relief, if based entirely on the prospects of a conduit system, has little foundation; at least during the term of Mayor Kumpf. The Council has passed the ordinance granting to L. R. Moore, J. Foster Rhodes and others the right to construct and operate a conduit system, but the Mayor vetoed it. Then the Council passed what it called a substitute for the original ordinance, although it would have taken the keenness of a Philadelphia lawyer to discover the difference. The Mayor vetoed this also, and the Council was unable to pass either one over his vetoes. The ten or twelve different companies in the city entitled by franchises to erect poles and string wires overhead, fought the ordinances at every step. The Mayor, in his veto, expressed his objections to the ordinance, as well as those of the companies opposing it, as follows:

"The investors of capital in telegraph, telephone and electric wires in this city have some rights, and should, at least, be consulted upon any subway system before the city grants a franchise, in its very nature an exclusive one; and if such franchise be granted in face of the protests of corporations that are expected to use and pay for it, it should be beyond question for a conduit system that will answer all purposes. It may be some improvements, whose practicability can be demonstrated, may soon be made, and we can force their use without the danger of building subways that will not carry arc light wires, or that arc light and telephone companies can both use. If such improvements be made, the city and such companies will gain no advantage therefrom, but the profits will go to the grantees and their successors named in the ordinance. I do not believe that one system or one conduit can safely carry electric light, telegraph and telephone wires together, and a grant of such franchise may prevent a proper system being built."

A. D. Hawk, manager of the Lawrence, Kans., exchange, has resigned, and is now telephone inspector in this city. He was succeeded at Lawrence by George Dick, for the past two years the night operator.

Kansas City, Mo., May 12. G. M.

Underground Electrical Conductors in Europe and America.

BY PROF. G. W. PLYMPTON, OF THE BROOKLYN SUBWAY COMMISSION, BEFORE THE ELECTRICAL ENGINENRS.

The problems of construction of underground systems of electrical conduction will have been solved when the telephone and the arc light systems are both buried under our streets, without impairing the efficiency or durability of either.

By this I mean that all the difficulties encountered in burying conductors are involved in converting telephone and arc light from aerial to underground systems. Telegraph lines and systems of incandescent lighting present fewer difficulties in the process of burying, and none of a kind not met with in dealing with the systems first mentioned.

The telephone problem is substantially solved. Some details only remain to be settled, among which may be mentioned the best size of conductor, the most serviceable insulation, and the maximum distance of effective service for either grounded or metallic circuits.

In Brooklyn, the general plan adopted is that of a conduit divided into ducts, through which cables containing from sixty to one hundred wires are drawn. The material of the conduit is for the most part creosoted wood. About ten miles of this is already in use in our city, and about four and a half miles of the Dorset concrete conduit. For the extensions of the underground systems for the present year, only creosoted timber is to be used.

Among the lessons learned from our experience are: 1st. That in creosoted conduits the use of cables covered with kerite or any similar rubber or gutta percha compound must be avoided. 2d. That in the so-called lead-covered cables, the use of pure lead is also to be avoided, as it is slowly converted into a porous and friable lead carbonate.

An alloy of lead with five or six per cent. of tin seems to resist the destructive action. 3d. That conducting wire first used is too small for satisfactory telephone service. The difficulties of induction and retardation led to complaints as soon as 4,000 or 5,000 feet of underground wire was put in service. The cables that are now being put in are made up of wires whose cross section is greater by one-third than that of the first wire, and they are protected by twice the thickness of insulation.

I mentioned the above conclusions as having been drawn from our own experience in Brooklyn.

In commencing our work we gathered such information as could be gleaned from localities where solutions of the problem had already been attempted. The impression so largely prevailed that in Europe all telephone and telegraph conductors were underground that our Board decided that a personal inspection of European systems should be made by one of our number. The duty devolved upon me. The result of my inquiry has been published in the scientific papers.

In regard to the burial of the arc light wires, I can only say that no method yet tried seems certain of success, most of them certainly insure the destruction of the underground conductors in from one to three years. But I have no doubt that a solution of the problem will soon be reached. Although the system will be kept apart from the telephone and telegraph subway, it does not seem likely that arc light conductors will be allowed in the same conduit with telephone wires, nor will they be distributed from the same man holes.

In saying that I believe that a solution of the problem will soon be found, I do not mean to assert that casualties like that recently recorded of a man in the Bowery, who lost his life by grasping the naked wire close to an arc lamp, can be prevented by any system burying wires. To prevent such *accidents* (if that is the term to be used), the arc lights must be buried with the wires.

All past experience teaches us to proceed cautiously. Nothing can now permanently check the growth of the telephone, the tele-

graph or the electric light; they have become necessities of our civilization, and any hasty or ill-advised enforcement of the law to convert all aerial to underground systems which should result in serious injury to them, would prove the surest way to perpetrate the nuisance of overhead wires and poles in the streets.

Electrical Enterprises in Richmond, Va.

To the Editor of Electrical Review:

Fewer cities of the country occupy a more prominent position in electrical enterprises than Richmond. First of all, the Union Passenger Railway Company—overhead wire, Sprague motors—have twenty cars in actual operation, and in a few days ten summer cars will be added. This line, as is well known, with its branches, is over twelve miles in length, and from its starting point on Church Hill to the New Reservoir Park in the west end, there is a clear run of six miles. Strangers visiting the city are greatly impressed with the running of these cars, and such is their elegance of construction and the speed and smoothness with which they are run, that they are nearly always crowded to their fullest capacity. Next winter the cars of this line will be warmed by the "Burton Electric Heater," the company having the exclusive privilege of using it on all lines of their street railways within the city of Richmond. It may be mentioned, also, that these heaters have been put in one of the rooms at the office of this company, No. 1103 Bank street. Four heaters are connected in series, the "feed wire" on the street in front of the office being "tapped" to supply the current. Inside the room is an ordinary electrical switch, by means of which the current may be turned on or cut off. The current used in these heaters would represent, in electrical energy, three-quarters of one horse-power to warm a room fifteen feet square.

Electric lighting may also be said to be on a "boom" at the present time in this city. The Virginia Electric Light and Power Company having purchased the franchises and plants of the Old Dominion Electric Light Company, across the river in Manchester, and of the Schuyler Electric Light Company, have the entire control of arc and incandescent lighting and the furnishing of electricity for power. This company having gone vigorously to work, the incandescent (Edison) light is rapidly supplanting gas in nearly all our hotels, club houses, stores and printing offices, and contracts have been made for supplying motors for elevators for some of our largest business houses. The *Richmond Dispatch* has had in operation for a month or more a five horse-power "Sprague" motor in its job office, although the *Times* claims priority in the use of electric motors for printing purposes, having used a "Baxter" motor on an arc light circuit several months ago.

The annual meeting of the stockholders of the Union Passenger Railway Company was held at their office on the 8th inst., but the election of officers was postponed to another meeting to be called for this purpose. General satisfaction was expressed with the working and business of this great enterprise.

Richmond, Va., May 9th.

Dynamo.

The Babcock & Wilcox Co. placed the following boilers in March and April:

	H. P.
Philadelphia Co., Westinghouse Building, Pittsburgh	152
Oneida Community, L'd, Community, N. Y.	61
L. Sterne & Co., L'd, London, 2d order	10
Walker Bros., London, for Ceylon, 7th order.	20
Perera & Portabella, for export	122
Alex. Marr, Aberdeen, Scotland	50
Nelson Bros., L'd, London, England	120
Massachusetts Inst. Technology, Boston, Mass.	208
South Bend Iron Works, So. Bend, Ind., 3d order	150
Cie Francaise d'Elairge Electrique, Paris, France	136
Alex. Smith, Aberdeen, Scotland	20
La Refineria Barcelona, Barcelona, Spain	208
Asa Leos & Co., L'd, Bombay	372
S. L. Ferranti, London, England	85
W. E. & J. Rigden, Faversham, England	130
Cornell University, Ithaca, New York, 2d order	500
Belasario Zayas Bazan, New York, for export	51
J. Arce & Co., City of Mexico	30
Gordon, Strobel & Laureau, Philadelphia, 8th order	136
London Elec. Supply Corp'n, London, Eng.	3,000
J. H. Stewart, Withington, for Bahia, Brazil.	62
Willward, Bradbury & Co., 3d order, Liverpool for Brazil	83
A. B. Bary, Moscow, Russia, 18th order.	164
Fisher & Co., Huddersfield, England	108
M. Crespo & Co., Havana, Cuba	136
Heaton Button Fastener Co., Providence, R. I.	92
Walsh, Lovett & Co., Birmingham, England	102
London Elec. Supply Corp'n, London, 2d order	93
Schwartzkopff Co., Berlin, Germany	230
Henry Maurer & Son, Maurers, N. J	244
Louisiana Sugar Refinery, New Orleans, 4th order	480
Troy Steel & Iron Co., Troy, N. Y., 3d order	1,248

The Rochester Telephone Agreement.

The telephone trouble at Rochester, N.Y., has finally reached an amicable settlement. Concessions have been made by both parties, the company agreeing to establish a flat rate in place of the proposed toll system, and the subscribers agreeing to rates which are about ten per cent. higher than the former charges. All suits are to be discontinued by both parties, and all former contracts are to be compromised provided the subscribers renew their relations with the company June 1st.

The Rochester people now promise to show what they can do in the way of building up as well as in tearing down, and with the restoration of amicable relations between the company and the subscribers, Rochester will undoubtedly have the largest exchange and the best exchange of any city of its size in the United States.

The Rochester *Democrat and Chronicle*, of May 10, contains the following account of the agreement:

Colonel David B. Parker, as representing the Bell Telephone Company of Buffalo, arrived in this city yesterday afternoon, and at once held a conference with His Honor, Mayor Parsons, informing him that the Bell people, through the directors at a meeting held Tuesday night, had decided to accept the proposition of the People's Association, as made through the Common Council. The mayor at once informed the city attorney and instructed him to make a draft of the agreement for filing. This document will be executed by the mayor and signed by Colonel Parker and the president of the Buffalo company this morning. The contract, as it will be executed, has already been published in full in the *Democrat and Chronicle*, but the principal points including the service rates are as follows:

First. The Bell Telephone Company of Buffalo shall abandon the toll system in Rochester, and establish a flat rate for all subscribers at the following rates: For business stations on single lines, $64 per year; on combination lines, $57; for doctors and lawyers on single lines, $54; on combination lines, $46; for residences on single lines, $45; on combination lines, $40; with mileage at the rate per mile of $20 per annum beyond one mile, except on combination lines, where each subscriber shall be entitled to one mile. Subscribers are to have special or combination lines at their option. The above-mentioned rates shall not be increased, nor such system changed for five years, except as the wires are placed underground. The Bell Telephone Company shall embody these terms and rates in the contract which they make with subscribers. This contract shall be mutual and fair in its terms and conditions, so as to secure to the telephone company the rentals for its telephones agreed upon, and to secure to the subscribers the service which is to be paid for.

Second. The company shall place its wires undergrond in the principal streets as rapidly as possible, and, to that end, agrees to substitute at least one-half mile of underground conduit each year, replacing poles for that distance, in localities to be indicated by the Executive Board, until at least three miles of poles have been replaced. The city is to be furnished free of charge as much space as it may need for its wires on the top cross-arms of all poles, and given space for 100 wires (one duct) in all underground conduits. The company shall give the city satisfactory security against possible damage caused by underground work, or by its poles or wires, in any way or manner.

Third. Telephone subscribers in the City of Rochester who ceased using their instruments in November, 1886, and who contract for service prior to May 1, 1888, shall receive credits for the amounts paid by them for service after November 20, 1886. All claims upon the contracts with subscribers existing November 20, 1886, for moneys which became payable after that date, shall be cancelled.

Fourth. All litigation between the Bell Telephone Company, of Buffalo, and the City of Rochester, or any of its subscribers in the City of Rochester, shall cease, and all pending suits be discontinued. The Bell Telephone Company, of Buffalo, shall pay the costs and reasonable counsel fees of opposing counsel in all such suits, including the suit against the City of Rochester, which has been discontinued, and the action by the people against the Telephone Company to compel it to remove certain of its poles, and all actions against its Rochester subscribers brought in the United States Court.

Colonel Parker, in conversation with a *Democrat and Chronicle* reporter last evening, said that the reason for the delay in the company's answer was not that there had been any objection by the directors to the proposition as it stands, but rather that it arose on account of the absence of some of the directors, without whose judgment and consideration it was not desired to act. A meeting of the directors was called last week for action on the submitted proposition, but as Director Williams did not return from Tennessee, an adjournment was taken to Monday night, when, because of the absence of Sherman S. Rodgers, another adjournment was taken to Tuesday night.

Mr. Parker expressed much gratification that after so prolonged a struggle, all differences are settled, and he received many a compliment last night from members of the People's Association for his success as a mediator. Contemplating its return to full citizenship in the "kicker" city, as Rochester had come to be known in the contest, a portion of the seventh floor, five large rooms, of the Wilder Building has been leased for the exchange, where Superintendent Mallett's office has already been moved. There are now about 200 instruments in use in the city, 100 of which have been placed within the last two weeks, and a full force of experts from the Buffalo and Boston offices have arrived in the city to assist in replacing other instruments, and putting the new exchange into order. The latest improved multiple switchboards are being placed in the exchange, under the supervision of J. J. Carty, of the Western Electric Company, Chicago, manufacturers of the boards. Dr. Culbertson, the superintendent of construction, has arrived in the city to assist in the transfer of the exchange, and to prepare plans for the underground work, which, in accordance with the contract, will be begun at once Besides Dr. Culbertson and Mr. Carty, eight other experts are in the city for this company. Colonel Parker said that with this force the exchange would be entirely removed within two weeks, and the whole system be restored to working order. "And then," said Colonel Parker to the reporter, "Your city will have as fine an exchange as there is in the United States."

His Excuse Upset by the Telephone.

Ex-Commissioner of Public Works Thomas Reynolds, whose saloon at the corner of Grove and Bay streets was opened Sunday, failed to appear before Justice Stilsing one morning, and sent word that there had been an accident. By telephone the Justice ascertained that no accident had occurred, and ordered Reynold's immediate arrest and incarceration.

*** The police telephone system at Lynn, Mass., is being improved and extended.

*** The Nebraska Telephone Company is putting in a number of new aerial cables at Omaha.

*** A long-distance telephone line from New York to Buffalo is in course of construction. It will pass five miles south of Rochester, but will loop into that city.

*** The Missouri & Kansas Telephone Company makes glad its stockholders this month by sending out the usual quarterly dividend of one and one-half per cent.

*** The York, Neb., telephone exchange of the Nebraska Telephone Company has been established. There are now eighty-nine telephones in use in the city. The exchange has communication with Omaha, Lincoln, Fremont and several other cities throughout the State.

*** Prof. A. Graham Bell sails for England June 2d, to attend before the Royal Commission in the instruction of deaf mutes. He has been gathering the latest information concerning American institutions, and will, no doubt, have valuable information to present to the Commission.

*** Mr. H. L. Storke, the distinguished telephone man, takes an occasional hand in politics. Just now he leads the delegation from the Twenty-seventh Congressional District of New York to the St. Louis Convention, and will be there to shout for Cleveland, his former Albany friend.

*** The report to the effect that the Southern New England Telephone Company would be compelled to pass its dividend for the coming year is incorrect. The treasurer's report, just issued, shows the finances to be in a good condition, and President Tyler states that he knows of no reason why the usual dividend will not be paid.

*** The telephone exchange at Kansas City has again escaped from a dangerous fire. The adjoining building was entirely destroyed, as it was some three years ago, but no damage to the exchange resulted. Before, a few cables were burned in two and there was a few days' delay in getting them spliced. This time there was no interruption in calls.

Telephonic News

"Hello."

The most of the telephones in town have shut up
On their hello—say, hello! oh, hello!
It seems that the business men thought they'd let up
On their hello—say, hello! oh, hello!
They said 'twas expensive—the thing didn't pay—
Without it they thought they'd exist in some way,
So now with the infidel Bob they all say:
No hell-oh! No hell-oh! No hell-oh!

If we could be free from the horrible dread
Of hell-oh—yes, hell-oh! Oh, hell-oh!
And believe it was true what Bob Ingersoll said,
No hell-oh! No hell-oh! No hell-oh!
No knowing what us wicked fellows would do—
It might be much tougher for me and for you,
So the safest way then is to hold to the view
That there's hell-oh—yes, hell-ho, hot hell-oh!

—*Buffalo Times.*

*** Mr. George H. Cole, superintendent of construction of the Southern Bell Telephone and Telegraph Company, Mr. W. T. Gentry, manager of the Atlanta Telephone Exchange, and Mr. W. L. Woodruff, manager of the Birmingham Exchange, have been hard at work with their corps of assistants, erecting the new switchboard in the exchange at Birmingham. The Law multiple switchboard system is used.

*** The Ohio Valley Telephone Company is laying pipes from the rear of the Telephone Exchange, on Green street, to Eighth and Main streets, Louisville, Ky. The company will place all the wires in the central part of the city underground, doing away with a great many telephone poles. The business of the company has increased so materially during the past few years that the present poles are almost inadequate to sustain their weight.

*** The Providence Telephone Company, of Providence, are talking of changing their central office system at Pawtucket. They are now using the switchboards made by the R. I. Electric Company. The system they will use is the multiple system of the Western Electric Company's manufacture. They will equip for about 500 subscribers. This is due to the good work they are receiving from the new multiple switchboards in Providence, which were put in the first of the year.

*** A man in Washington Territory has patented an ingenious telephone whereby it is possible with the aid of electricity to detect the presence of metal in rocks. This is just the instrument needed by the Aqueduct Investigating Committee. Let them adjust the wires, put the sound receiver to their ears, turn on the current, and listen to the clink, clink, clink of the boodle, and locate the gentleman's pocket which holds it.—*N. Y. Tribune.*

*** The American Bell Telephone Company issued a circular last week offering stockholders the right to subscribe at par for 2,000,000 seven per cent. ten-year bonds, issued for the construction of the long-distance telephone system. The company will have the right to redeem the loan August 1, 1890, or any interest day thereafter, at 1.10 and interest. The transfer books close from June 1 to June 10, inclusive. Each holder of fifty shares is entitled to subscribe to one $1,000 bond.

*** At the annual meeting of the stockholders of the Southern New England Telephone Company, held at New Haven, Messrs. Morris F. Tyler, Lyman B. Jewell, Herrick P. Frost, William E. Downes, Thomas Sherwin, O. E. Morgan, A. W. Jilson, James English, Samuel E. Merwin were elected directors. Ex-Congressman Mitchell retired from the board and was succeeded by General S. E. Merwin. Morris F. Tyler was re-elected president, Herrick P. Frost, general manager, and Major A. H. Embler secretary and treasurer.

The new hotel at Santa Inez, California, two stories, 100x200 feet, will be lighted by electricity, the power being furnished by water.

I. L. Young will build an electric railroad in Huntington, W. Va., to be finished July 1st, 1888. The length of the line will be three and one half miles.

The Knoxville and fountain Head Railroad, of Knoxville, Tenn., are making surveys for an electric railroad. They are also to erect an electric light plant.

The "C. & C." Electric Motor Company, New York, are now manufacturing motors from ⅛ to 25 horse-power, having increased their facilities so as to manufacture the larger sizes very promptly.

The Sprague Company have just received an order for a large number of motors to be used in the new marble building of A. J. Drexel, Philadelphia. The average power of the motors is about 7½ horse power.

The Sprague Electric Railway and Motor Company have just moved into their new and capacious offices, 16 and 18 Broad street, New York, with increased facilities for the accomodation of their friends and customers.

At Patchogue, L. I., the project of building a street railroad is being agitated, and a petition asking the Legislature to grant the Patchogue Railway Company a franchise has already been sent to Albany. It is not as yet decided whether horses or electricity will be used.

The Sprague Electric Railway and Motor Company are just completing an installation of electric motors at the "Ophir Farm," White Plains, N. J., the country residence of Mr. Whitelaw Reid. The motors are to be used for pumping water, stable work, and other purposes.

The California Electric Light Company has purchased on Townsend street near Second, a lot 275x100 feet, on which to erect a $25,000 brick building. $100,000 worth of machinery will be put in. This extension of business is demanded because of the increased use of electric motors. Motors will be furnished up to 100 horse power.

President Thomas C. Barr, of the Peoples, Passenger Railway, Philadelphia, has announced that the company will shortly place a large Wharton electric motor on the Fourth and Eighth streets branch of the system. The car will be of the eight-wheel pattern, and 22 feet in length, and will run between the depot at Eighth and Dauphin streets and Walnut street.

Mr. A. D. Juillard, vice-president of the Brush Electric Illuminating Company, New York, speaks very highly of the Baxter motors in use in his large dry goods house and his warehouses. He says: "It convinces me you have solved, beyond doubt, the question of a successful use of electricity for power purposes, and I cheerfully recommend your motor to any one needing power for elevators or any mechanical business."

The Aldermanic Committeee on Railroads, New York, has agreed to report favorably the Fourth Avenue Railroad Company's application for permission to use electric motors. The report will be presented at the next meeting of the Common Council. It gives the results of the committee's investigations into the operations of the motor (the Julien) the company has been experimenting with, the information collected concerning similar roads in France and Germany, and arguments in their favor, one of which is their superior cleanliness. The Julien Company have the ten cars contracted for nearly completed, and the station to be used for charging the storage batteries is being rapidly constructed.

The Richmond Electric Railway.

The following complimentary letter was received last week from the syndicate which put in the Richmond Union Passenger Railway. The Sprague Company had no financial interest in this road, neither has the syndicate any interest in the Sprague Company. This road is not only an electrical but a financial success, having some days carried nearly thirteen thousand passengers:

E. H. JOHNSON, Esq., Prest. Sprague Electric Railway and Motor Co.,

DEAR SIR—We take pleasure in notifying you of our acceptance of the electrical equipment of the Richmond Union Passenger Railway.

The road which you have equipped under most trying conditions has been one of the most difficult, if not *the* most difficult, which could be met with in street railway work.

The excessive and continuous grades, the numerous and sharp curves, the gradients in these curves, the weight of the cars and the heavy loads which they have been required to carry, together with the extent of the system and the number of cars in operation, constitute the enterprise the largest and most difficult of its character yet inaugurated in any part of the world.

We must confess that we have sometimes shared the doubts that others have been so free to express, as to the possibility of the successful completion of this work; and hence, it is with the greater pleasure that we acknowledge the successful fulfilment of all the terms and conditions of the contract, and compliment you upon having achieved so signal a success.

The immediate financial success of the road has been unquestionably due in a measure to the economy developed in the operation of your system as compared with any other method of street car propulsion.

We shall be pleased to meet your treasurer to-day, when we will make a full settlement as agreed. We are already contemplating an increase of equipment, and hope before the close of this year to have at least seventy of your cars in operation.

Yours very truly,
(*Signed*) THORNTON N. MOTLEY,
HENRY STEERS,
MAURICE B. FLYNN,
Committee on Construction.

Last Sunday being a pleasant day, it was decided to put on the road the ten open cars. This meant the immediate employment of forty new men, conductors and drivers (ten of each for day and night service respectively), who knew comparatively nothing about electric railroads, and especially of this most difficult road to operate on account of the heavy grades and sharp curves. That everything ran smoothly without hitch or fault, nearly 13,000 passengers being carried, shows the excellence of the Sprague system.

An Electric Light on a Sand Bar.

The Old Colony Steamboat Company and the Navy Department have completed arrangements whereby another substantial light will soon help to light the Newport harbor. For some time the Old Colony Company has felt the need of a better light on the sand bar at the south end of Goat Island. Recently the company, through Mr. George Pierce, its agent, entered into negotiations with the department, through the authorities at the Torpedo Station, which have successfully culminated, and the work of laying electric wires from the station to the old beacon at the end of the sand bar will soon be begun, and before long a high-powered arc light will replace the present oil lamp. The lamp will be fed from the station plant.

Proposals Wanted.

At Jacksonville, Fla., proposals are wanted until July 1, for electric lights, the plant to be owned and operated by the contractor, the city to take 30 arc lights; works to be in operation by October 1, 1888. Address, William Henry, Mayor, as above.

The Common Council of Schenectady, N. Y., has passed resolutions ordering the committee on lamps to advertise for proposals for lighting the city with electric arc lights by means of 2,000 candle-power lamps, etc., according to specifications.

The Ashland Lighting Company, of Ashland, Wis., will expend the sum of $8,000 on improvements at the plant during the coming summer.

At Saratoga Springs, N. Y., proposals are wanted until June 4 for lighting the streets, buildings, etc., of this place by gas or other light, for the term of one year from August 15, 1888. Address, Samuel F. Corey, City Clerk, as above.

Death of Mr. Phelps.

Mr. George M. Phelps, Sr., died of paralysis of the lungs at his Brooklyn residence Friday night, May 18, at the age of 68. Mr. Phelps was widely known in electrical circles and had invented many telegraphic and telephonic improvements of value, and until recently, when he retired from active business on account of ill-health, had had charge of large manufacturing interests. His death takes from electrical circles a man of brains and capacity, and he will be mourned by a large list of friends.

The funeral was held last Sunday at the family residence in Brooklyn, interment occurring in Oakwood Cemetery at Troy, N. Y.

Visits to the Phonograph at the Electric Club.

Last week was a busy one at the Electric Club. There were hundreds of visitors desirous of seeing the improved Edison phonograph and test its qualities; and then, in addition, a great many who were acquainted with the members of the Club availed themselves of this opportunity to inspect the new Club house.

Tickets were issued, so that any member could, by endorsing them, invite friends, and this was done to a large extent. A great many ladies visited the Club and listened to the phonograph and admired the Club rooms.

General Sherman sent a number of friends around from the Fifth Avenue Hotel during the week.

Monday night Editor Bailey, of Utica, and Editor Fleming, of Buffalo, tore themselves away from the Democratic brethren long enough to visit the Club with Mr. W. M. Clarke and satisfactorily test the phonograph.

Col. S. J. Fox, of New Haven, after listening to a baritone solo repeated to him by the phonograph, turned to Mr. Gilliland, and said: "Did you ever hear Mr. Bushnell sing?" Mr. Gilliland said he had. "Well, this sounds very much like him," replied Colonel Fox. "I am not surprised at that," responded the phonograph worker, "for Mr. Bushnell sang into this instrument this morning." It "was the same" Bushnell, and his singing charms all who hear it.

Mr. Chas. A. Schieren, the well known belt manufacturer, takes quite an interest in the Club's success, and was a delighted visitor to the phonograph exhibition. Mr. Schieren has evidenced his interest in the Club by a substantial subscription to its bonds.

Senator Hobart, of New Jersey, expressed a great interest in the phonograph, and was an attentive listener to both addresses Saturday night at the Electric Club.

Dr. Leonard Waldo, of the Scovill Manufacturing Company, was a New York and Electric Club visitor last week.

Mr. Chas. A. Stevenson, the well-known actor and theatrical manager, whose wife, Kate Claxton, is so popularly known, sang a number of songs into the phonograph, as well as recited several humorous selections. Mr. Stevenson, who is a member of the Electric Club, is fascinated with this work of Edison's, and brought several of his theatrical friends in to hear it.

Professor Mayer, of Stevens Institute, and several friends from the Century Club, visited the Electric Club during the week, and examined the phonograph. Professor Mayer took a personal interest in this invention, having made a number of experiments in the same direction a number of years ago.

Father Frank Ridlon came over to New York last week and tried his lungs on the phonograph, and listened to what it had to say to him.

Says *Modern Light and Heat*, of Boston: "If one wants to know the fresh electrical arrivals in New York, consult the register of the New York Electric Club, or during business hours visit the elegant offices of the ELECTRICAL REVIEW, the recognized headquarters of all electrical men. One will always be hospitably received at either place."

The great dailies outside of New York contained interesting accounts of the phonograph exhibition at the Electric Club. The following special despatch appeared in several out-of-town journals under date of May 12:

To-night Inventor Edison exhibited his phonograph—talking machine—to the Electric Club in its handsome quarters on East Twenty-second street. Great lawyers, literary men of fame, dramatists, doctors, and not a few millionaires, were in attendance. In various parts of the club house were placed the newest forms of phonographs which were now for the first time seen outside Edison's laboratory. All had heard, of course, about this extraordinary instrument, for it is now just ten years since Edison startled the world by announcing the invention of his "talking machine," which seemed less a machine than an organism. In place of the cumbersome affair with its loud metallic tone, was a neat little instrument, smaller than a typewriter, but suggesting curiously a compromise between that familiar machine and the telegraph instrument to be seen in any railroad station. Partly covering this is a little arrangement of polished brass resembling somewhat a pair of eyeglasses with broad flat frames. In place of the glasses, however, are two diaphragms, one of which is termed the recorder—for it is used to record the speech—and the other the reproducer, for with it the "talking back" is accomplished. To the left of the cylinder is a small square box containing the small electric motor, which is one of the chief improvements lately added by Mr. Edison.

Of the ten instruments exhibited this evening, nine were, for convenience sake, limited to reproducing. Conversations, passages of piano music, solos on a cornet, and a recitation by a well-known humorist, had been recorded on various cylinders, and over and over again the little instrument ground them out to the wonderment of the listeners. The remaining phonograph was arranged for recording as well as reproducing, and the visitors amused themselves by talking into it and then hearing their own words ground out again. On every side there were exclamations of amazement, and prophecies as to the various practical directions in which the invention will be used. That it will be useful for educational purposes, and of practical advantage to business men, was the general verdict of the distinguished assemblage who gazed in wonderment on the latest piece of brain-work of the wizard of Menlo Park.

The Phonograph and Music.

The musical achievements of Mr. Edison's latest type of phonograph, of which some account was given in the *Evening Post* of Saturday, cannot fail to interest all music lovers, and especially those musicians who long to know the exact peculiarities of time and rhythm adopted by the great composers in conducting their own works. Had Beethoven possessed a phonograph, the musical world would not be left to the uncertainties of metronomic indications which we may interpret wrongly, and which at best are but feeble suggestions; while Mozart, who had not even a metronome, might have saved his admirers many a squabble by giving the exact fashion in which he wished his symphonies to be played. According to all accounts, the phonograph will at least give the true time of a piece of music, no matter how constant or how delicate the variations. Probably the machine will do much more than this. There seems to be no reason to doubt that it will give a fair echo of a musical performance. All musicians will see at once of what immense value even an accurate echo, in good time and tune, may be. It will give the student the phrasing of great soloists—something which no expression marks can convey. Future generations will be able to learn, if they care to know, exactly how Rubinstein "phrased" the "Emperor" concerto, or with what mannerisms Mme. Patti sang "Home Sweet Home"; they will be able to compare the manner in which one famous conductor led the masterpieces of musical art with the conception of his rivals; and will know infinitely more about the music of to-day than we know of the music of our ancestors. Finally, the old gentleman, slightly deaf, who insists that there is no such music nowadays as was to be heard in his youth, will be brought to book almost literally, and be confounded with phonographic proofs to the contrary.—*Evening Post.*

—— The $50,000 business block to be erected at Oceanside, San Francisco, by A. J. Meyers, will be lighted by electricity.

—— The Riverside, California, Electric Light Company have thirty lights in operation, and will shortly put in twenty more.

Edison's High Economy Converter System.

The inventor says of this invention: "In systems wherein a number of converters are used, the difficulty arises that, although the whole or the greater number of the lamps supplied are in circuit and using current only during about four hours out of the twenty-four, the converters themselves are using current during the whole day. There is a loss of from seven to twelve per cent., according to the construction in each converter, and this loss goes on all the time, whether all the lamps are in circuit or only a very few of them, so that the removal of lamps does not cause a corresponding reduction in the amount of current required in the system. It will be seen that this detracts enormously from the economy of the system, since though only a few lamps may be in use it is necessary to always keep the generation of current at a sufficient amount to supply the loss in all the converters. In some cases the current used in the converters—which of course is a dead loss to those operating the plant—will be equal in amount to that sold to the consumers. Evidently this results in a great diminuition of the profits of the business.

"I propose to remedy this by so arranging the system, that only so many converters will be in circuit at any time, as are required to supply the lamps or translating devices actually in use, providing the converters, or certain of them, with switches, whereby their primary and secondary circuits may be opened or closed, as desired, and thus any desired number of the converters may be removed from, or maintained in connection with the system, according to the amount of current required to be used at any time. I prefer to employ switches controlled from the central station, whereby any particular switch may be operated without affecting the others, though they are all controlled by the same circuit."

Various ways of doing the switching are suggested. The figure shows the switches controlled from the station by the same circuit. *A* is the generator, and *B* the converters.

Electric Light Philosophy.

TO THE EDITOR OF ELECTRICAL REVIEW:

An Omaha correspondent, with an eye single to the general good of community, sends me the following story of "Two Fools":

"A young man named Dietz was passing the corner of Sixteenth and Capitol avenue, about 9 o'clock last night, and, being in a frolicsome mood, stopped to swing on a broken telephone wire. He recovered consciousness in a few minutes, and wended his way homeward in a more dignified manner.

"About an hour afterward another man passing the same spot saw the electric spark at the end of the wire, and, insanely imagining what was about to occur, turned in an alarm of fire. The department turned out, the wire was cut, the electric light company was ordered to shut off the dynamo, all in the space of fifteen minutes."

With all of which for a text, there might be a sermon preached, on the necessity of placing wires underground, and of putting the fool killer on the track of the parties referred to, who thus "monkeyed with the buzz saw."

While it is the duty of the electric light people to throw around their systems all the possible safeguards which electrical and mechanical knowledge can invent or adapt, within reasonable cost limits; it probably is not now, and perhaps never can be, possible to prevent the human monkey from risking his life to gratify his curiosity.

The school boy finds pleasure in daring to slide over the ice that threatens momentarily to open and give him a ducking; yet where was the boy who afterwards amounted to anything in this world who would take a stump to slide or run over a "ticklish bender," or was not better pleased to jump over a yawning, muddy ditch than try his skill on clean, level ground?

Dollars to dumplings, the first of the two parties referred to above was a leader of school boy athletes, while the other played with dolls, and was a school marm's pet.

There is something about electricity which irresistibly attracts humanity, and develops curiosity to a remarkable degree. Its ways are so mysterious, its effects so startling and brilliant, while its origin is so enigmatical—in short, the force is so thoroughly unknown, and its dangerous character so little understood, that it is next to impossible to so hedge it in that the human monkey will refrain from touching anything labelled "Hands off," and the larger the lettering, the greater the desire to take the dare.

Yet there is something to be said against some underground systems, too. There is, to-day, in Chicago, a piece of underground which has given out between two manholes. The cable was placed in a wooden box, buried in cement. It is solid, it is durable, as an electrical mummy, and will last until the resurrection cows come home, unless the council relents, permits the street to be torn up, and the corpse to be raised. In the meantime there is much to be said about different methods of "undergrounding" telephone lines, of which this system, fortunately protected by a patent, is one.

And again, there are uses for overhead wires which until now have never, to my knowledge, been developed. See this extract from a Chicago journal of the 4th instant.

WHERE TELEGRAPH WIRES DID SOME GOOD.

"A ten-foot section of the cornice of Nos. 117-119 North Clark street fell without warning about 8.30 last night. Fortunately it caught in the telegraph wires, and only fragments struck the passers-by. Some women were badly frightened, but no one was injured. Truck No. 3 was sent to the place by a police officer and the wires were cleared."

Now there is an argument worth half a dozen of that miasmatic influence-plea of Weeks and the New York electrical opponents of the underground edicts, and some others, out west as well. C. C. H.

E. M. F. of the Voltaic Arc.

The experiments were made with a hand-regulated lamp, working with a current of 7.7 amperes and with 10 mm. carbons. The values for a and b in the equation for the potential difference in terms of the length of arc L, viz., $P = a + b\,L$, were found to be $a = 35.4$ to 45.4; $b = 1.74$ to 3.2.

Further experiments were made (a) with currents of 1.3 to 5.2 amperes and with 7 mm. carbons at top and 5 mm. carbons at bottom; (b) with currents of 24 to 39.4 amperes and 30 mm. carbons; and it was found that a increased with the current density from about 25 to 45, while b diminished. The constant a may be replaced by the expression $x + y\,I$, where x and y are new constants depending on the quality of the carbons, and I is the current. Since a decreases both for an increase in the current, as well as for an increase in the section of the arc, the effects are probably due to a surface resistance rather than to a counter electro-motive force.

The Citizens' Electric Illuminating Co., of Pittston, Pa., will erect a $40,000 plant. K. J. Ross is interested in the company.

New Form of Accumulator.

A lead plate is built up of alternately smooth and corrugated strips of lead 3 to 4 cm. thick, with spaces between made by inserting small pieces of lead, the ends of the strips being soldered together. This plate is placed in a bath of nitrate of lead as anode, the kathode being a copper plate in a solution of sulphate of copper. The plate thus formed is then placed in dilute sulphuric acid together with plain lead plates. On charging, the E.M.F. at first rises very quickly, and then slowly to 2.5 volts; on discharging, the E.M.F. sinks rapidly from 2.5 volts to 2.2 volts, but afterwards falls slowly.

She Saw the Gold.

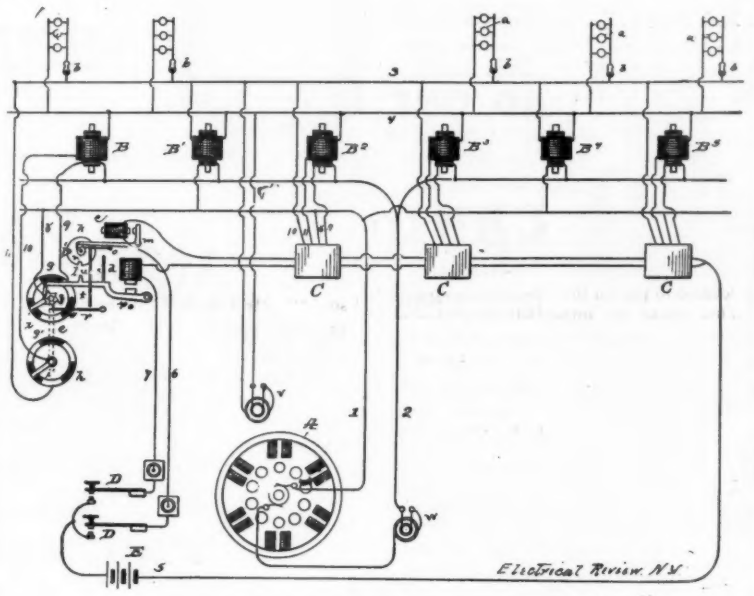
"Mamma, I know it's true about the golden streets in heaven."

"Why, how do you know, Maud?"

"Because, when I was on deck with nurse last night, something made a noise and the sky split clear across, and then I saw the gold shining through."

Silk Braid for Filaments.

Macfarlane & Co., of Yonkers, can supply silk braiding, cleaned from all gum and impure substances, for manufacture of incandescent lamps. It is very valuable in making filaments.



EDISON'S HIGH ECONOMY CONVERTER SYSTEM.

—— The electric lights must go, says an exchange. It has been found that the enterprising English sparrows utilize it to work by at night when their nests have been destroyed and they are in a hurry to rebuild.

—— At Waupaca, Wis., the break at the dam of the Electric Light Company is being repaired by putting in a stone crib. A new building is being erected, and the plant will be in running order again in about two weeks.

—— The Jersey City Electric Light Company is now running fifteen dynamos with a capacity of 260 lights. They are about putting in batteries manufactured by the Accumulator Company, New York, and will introduce the incandescent light. Lewis F. Lyne is the superintendent in charge.

—— Mr. Edison is tampering with fate. A man who wilfully and with malice aforethought perfects an apparatus so lost to shame as to reproduce the notes of the cornet, lays himself open to assassination. Mr. Edison must take care of himself or forget the secret of his vile machine.—*Evening Sun.*

—— The Freehold, N. J., Electric Light Company has organized by the election of the following officers: President, D. C. Perrine; treasurer, C. A. Bennett; secretary, C. A. Bennett, Jr. The directors have authorized the signing of a contract for the erection of an Edison plant, which, it is stipulated, shall be in complete working order on or before June 15th.

ELECTRIC LIGHT NEWS

—— John Tregoning, for the last three years connected with the Mather Electric Company's factories in Hartford and Manchester, has resigned and will move to Lynn, Mass., to take charge of a department for the manufacture of electric welding machinery in the factory of the Thomson-Houston Company.

—— Superintendent Sanderson of the Pancoast Coal Company, Carbondale, Pa., has recently erected a residence and stable, which, in addition to the company store, engine room, breaker and mine, will be thoroughly lit by incandescent electric light. The Pancoast mine and breaker is the first in the valley to use electric light.

—— Within the last year the York (Neb.) Gas and Electric Company has put a plant in the city. It was organized with a capital of $10,000, and has now burning 300 incandescent and sixteen arc lights. It has twenty-five arc light dynamo, with a 100 horse-power engine and boiler. It has now eight miles of wire stretched throughout the city.

—— W. A. Wright, one of the special agents of the Brush Company in the South, has recently sold to the city of Greenville, S. C., an electric light plant, consisting of sixty arc lamps and 400 or 500 incandescence lamps. The Ball Engine Company of Erie, Pa., furnishes the steam plant. This plant will be one of the most complete electric light plants in the Southern States.

—— The Sawyer-Man Electric Company has moved its general offices from 32 Nassau street, city, to 510 West 23d street. This new building, which includes Nos. 510 to 534 on 23d street, makes a very commodious and extensive factory and general office building. Every facility for turning out a large number of incandescent lamps daily has been put in, and the offices are most convenient, well lighted, and comfortable.

—— A special from Goshen, N. Y., says: Farm laborers and farmers' sons in this county are greatly exercised over the fact that one farmer has bought a small dynamo which will run by water power. This will furnish so much light that any farm work can be done at night as easily as in the day time. The farm hands don't favor the innovation, and seem to fear they will be called upon to work the entire twenty-four hours during the busy seeding and harvest times.

—— The Willimantic, Conn., Electric Light Company is preparing for the introduction of electric lights as per vote of the borough. The basement of the old Morrison machine shop is to be utilized for this purpose, power being furnished by the present 100 horse-power engine now in use by the machine company, who will procure a new 50 horse-power engine in its place. The poles will be procured soon and placed in position, the wires put up, and the light in running order probably by July 1.

——Kentucky has been heretofore considered a very old fogyish State in nearly everything outside of horses, blue grass, moonshiners, and female loveliness. Louisville has broken the record. The council of that city recently decided to appoint an inspector of electric lights. There were but two candidates, andan old timer, Mr. W. H. Johnson, was elected with but little opposition. Mr. J. commenced his electrical education with W. & L. E. Gusley, Troy, N. Y., makers of instruments of precision. Thence to the shop of Geo. M. Phelps, the elder, afterward at Cleveland, and finally at Louisville. He was for years manufacturer and inventor for the Western Union Company. The greater part of Mr. Johnson's life has been spent in the pursuit of electrical knowledge, practical and theoretical, and the City of St. Louis may be congratulated on having ignored politics and appointed a thoroughly competent and honest inspector, without asking how he will vote.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MAY 15, 1888.

382,714 Switch for electric motors. 382,715 Switching device for electric motors; Richard H. Mather, Windsor, Conn.

382,734 Coin operated electrical apparatus; Norman W. Russ, London, England.

382,738 Galvanic battery; George H. Sloane, Boston, Mass.

382,766 Electro magnetic car brake; Albert P. Massey, Watertown, N. Y., assignor to the Eames' Vacuum Brake Company, same place.

382,767 Manufacture of telegraph cables. 382,768 Method of manufacturing electric cables; William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place.

382,778 Underground conduit for electric wires; Walter F. Smith, Philadelphia, Pa.

382,781 Insulated wire; Joseph D. Thomas, New York, N. Y.

382,788 Automatic fire alarm; John Young, Chicago, Ill., assignor to the Western Electric Company, same place.

382,829. Telegraph cable; William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place.

382,845 Commutator for dynamo electric machines; Nikola Tesla, New York, N. Y., assignor of one-half to Charles F. Peck, Englewood, N. J.

382,846 Manufacture of incandescent electric lamps; Edward P. Thompson, Elizabeth, N. J.

382,856 Repeating induction coil; John A. Barrett, Brooklyn, N. Y.

382,876 382,877 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor to the Electric Car Company of America, same place.

382,914 Electric indicator; John Tregoning, Hartford, Conn.

382,941 Electrical agricultural system. Edward M. Bentley, New York, N. Y.

382,968 Storage battery; Charles D. P. Gibson, New York, N. Y.

382,976 Electric tele-thermoscope; Harry W. Hardinge, Leadville, Colo.

382,990 Electrically propelled vehicle; Walter H. Knight, New York, N. Y.

382,997 Directory indicator for buildings, etc.; Thomas J. McTighe, New York, N. Y.

383,013 Telephone exchange system. 383,014 Switch-board. 383,015 Clearing out annunciator. 383,016 Automatic shunt for magneto generators. 383,017 Test circuit for telephone call boxes. 383,018 Key board apparatus for telephone exchanges; Charles E. Scribner, Chicago, Ills., assignor to the Western Electric Company same place.

383,046 Incandescent lamp attachment; Harry M. Doubleday, Columbus, Ohio.

OFFICE OF LIGHT HOUSE INSPECTOR, Third District, Tompkinsville, N. Y., P. O. Box 2128, New York City, May 17th, 1888. **PROPOSALS** will be received at this office until 2 o'clock P. M. on Wednesday, the 23d day of May, 1888, for supplying the electric plant necessary for lighting buoys to mark Gedney's Channel, New York Bay. The plant will include dynamos, cables and other materials, full information relative to which can be obtained on application to this office. The right is reserved to reject any or all bids and to waive any defects.

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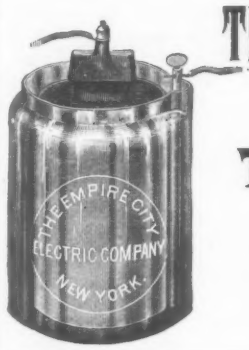

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